the OIL AND GAS JOURNAL
PUBLISHED WEEKLY SEPTEMBER 11, 1961

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System exceeds standards despite varying loads p. 106

SERVICE

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"Make service available to oilmen everywhere, regardless of climate, difficulties of terrain, or distance."

This policy has guided Halliburton for over 35 years in service to the oil industry. This service is consistent with respect to quality and availability regardless of world-wide location.

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DUNCAN, OKLAHOMA

OIL AND GAS JOURNAL
Vol. 59, No. 37

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Drilling-Production

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By R. E. Weldon, Jr.

Gas vented from lease storage batteries in the U. S. is worth about $35,000,000 per year. Large-volume storage areas are ideal for vapor-recovery systems, but small leases are susceptible, too. Here's how to evaluate your leases and see if a recovery system will pay out.

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By E. T. Guerrero

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By Ed McGhee

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Better Drilling Practices Speed California Drilling 137

By B. M. Bumgardner

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Pipelining

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By J. M. Tygret and Robert Ulrich

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THE OIL AND GAS JOURNAL **Newsletter**

September 11, 1961

Significant this week

East Texas' Fairway field is generating a lot of excitement—and there's plenty of reason for the hubbub.

Giant field's ultimate recoverable reserves are figured at a possible 400 million barrels. That would rank it with such huge East Texas fields as Van and Hawkins.

Fairway, little more than a year old, is certainly the biggest domestic oil discovery since Aneth. Some geologists think it may be top U. S. discovery in a decade or more.

Last week, Fairway had chalked up an even 50 completions. Nine more holes were going down, and eight others were about ready to start.

By year's end, there may be 80 completions in the sprawling Henderson-Anderson counties pool—which still hasn't been defined (p. 75).

Sampling of 35 oil companies shows chief executives were paid an average of more than $129,000 in 1960.

Size of company—as gaged by sales and profits—decided total compensation which included salary, bonus, stock plan or other supplement.

Survey also turned up these facts in comparing oil with other industries: In smaller companies, head men averaged better pay. In big companies, chief executives got less than all-industry average (p. 80).

Now there's a new kind of "clearing house" for drilling and lease deals.

Three cities—Houston, Tulsa, and Casper—are home bases for separate periodic reports on farmouts, drilling proposals, and leases up for sale.

These enterprises haven't proved themselves yet. But the owners think their systems beat the usual company-to-company or broker-to-company contacts (p. 90).

Novel "hydrant" fueling system for airports has been installed by Standard Oil Co. of California.

Fuel is pipelined to Los Angeles' new International Airport from Socal's El Segundo refinery. From underground storage tanks, fuel is pumped into plane tanks through hydrant-hose connection made by special truck.

Similar jet-age fueling systems are planned at other airports (p. 95).

Tough problem of pipelining across Alaska's Turnagain Arm has been licked, and Anchorage is getting Kenai gas.

Work on $20-million, 85-mile line started a year ago, but was held up by difficulties in spanning 8½-mile Turnagain. Tides there go as high as 25 ft. (p. 78).

On the foreign scene:

Arguments between Iraq and IPC over oil operations in the middle eastern country have reached the showdown stage.

Western companies look on Iraq as a decisive battleground in the fight to keep their role as producers in backward nations. If they give in to Premier Kassim's demands for a 20% share of IPC itself and a bigger hunk of oil profits, other countries are bound to make similar grabs.

On the other hand, the stubborn Kassim has vowed to his people that he'll never surrender (p. 96).

If France can go on exploiting oil it has found in Sahara, Algerians can have political sovereignty over the desert.

That's General Charles de Gaulle's latest offer in efforts to settle the blood-drenched Algerian rebellion.

Future of Sahara and its oil has been major stumbling block in negotiations (p. 99).

Mobil International and its partners are filling a 321-mile 30-in. pipeline which links Ohanet oil field in French Sahara with input terminal of Hassi Messaoud-Mediterranean pipeline.

This gives Mobil distinction of being first American company to have its own Algerian production (p. 100).

New pipeline system being operated in eastern Venezuela by Phillips Petroleum will provide access to world markets for recently discovered Morichal oil field (p. 97).

Dutch company, NAM, has moved big drilling platform onto location for first offshore test in North Sea (p. 98).

News in the making

Good long-range bet:

Export-import bank policies may be broadened to permit long-term, over-all loan backing on oil projects that U. S. firms build abroad for private or government firms.

Earlier this year, Ex-Im Bank began offering medium-term loan assistance (up to 5 years) on equipment sales only—not complete projects. There has been no rush to get such loans: Only five have been okayed so far, and they were fairly small.

As a result, administration officials are beginning to consider an expanded program. No immediate action is in sight, but move may come about in the months ahead.

Next Mohole development: Selection of prime contractor from among those who submit proposals to National Science Foundation by September 11 deadline.

At first, prime contractor will be given relatively minor job of doing more core drilling in deep water. Then will come the big task: Drilling into earth's inner crust.

This is what you can expect in Internal Revenue Service's study of ABC-type sales:

IRS probably will soon issue a "clarifying" statement to spell out what's involved, along with effective date to be applied to any changes. Then a public hearing probably will be set.

Don't write off chances of another maritime flareup.

The whipsawing of maritime unions—each driving for a better contract—is haunting tanker operators after things were believed to be settled.

National Maritime Union is telling operators their tentative agreement no longer holds, since another union—the Maritime Engineers—got superior benefits. This raises possibility of a strike after Taft-Hartley injunction expires September 21, although such a walkout isn't considered likely.

Making a hit: Closed-loop, on-line control of refining and petrochemical processes with large digital computers.

More and more companies are backing up their interest with cash. Number of projects installed on commercial units, or definitely committed, stands at 13. Add three more for computer-controlled pilot plants.

New line of research could help attempts to make shale-oil recovery more attractive from economic standpoint.

Companies interested in problem have necessary engineering knowhow. But cost has been a drawback.

Now U. S. Bureau of Mines has come up with method of removing impurities from kerogen—the oil-forming portion of the shale—without changing it drastically. Lithium aluminum hydride cuts troublesome pyrite content of kerogen to 0.02%.

Bureau feels this paves way for sharpened attack on shale-exploitation problems.

Look for Czechoslovakia to complete its 250-mile section of Comecon pipeline before the end of this month.

That would mean almost exactly 2 years of construction.

Link runs from Russian border, near Uzhgorod, to Bratislava on Danube River. It'll be part of system which will haul crude from Second Baku, east of Volga, to Czechoslovakia, Hungary, Poland, and East Germany.

Half-ton pick-up trucks are replacing many passenger cars in Phillips Petroleum's field work.

Reason: Average cost of operating pickup is $450 lower, on yearly basis, than cost of running car. As bonuses, pick-ups get over rough terrain better, haul bulky equipment.

Market memo

Sept. 11, 1961

Uneasiness in crude prices is apparent from lower postings popping up for East Texas, the Gulf Coast, and New Mexico.

In East Texas, Sun, Mobil, General American, and Panola have reduced their prices by 15 cents a barrel to $3.10 where Tidewater and Sinclair have been pricing previously. Sun buys about 10,000 bbl. daily, Mobil 11,300, and General American 13,000. Premier cut 5 cents also to $3.10 on 5,000 bbl. daily. Lowest price for East Texas is the $3.05 posted for more than a year by Atlantic Refining. The new cuts leave only about 40% of East Texas crude still priced at $3.25. **Reason given for the changes:** Need to revalue the crude to meet competition.

Other crude cuts: Conoco cut 6 cents off the price for New Mexico sour in Chaves, Eddy, and Lea counties of New Mexico. This restores the $2.95 per barrel price in effect this spring when Conoco posted a raise. About 14,000 bbl. daily is involved . . . **Plymouth** cut 5 cents to $3.25 per barrel in Nueces, Refugio, and San Patricio counties on the Gulf Coast.

Some increases: Mobil advanced the price for San Ardo heavy crude in California by 3 to 5 cents a barrel . . . **Sohio** posted a 7-cent increase to $2.76 for crude in Dudley field, Illinois . . . **Imperial** added 2 cents per barrel to its prices for crude in 9 Alberta fields.

Signs of **weakness in gasoline** markets are all around.

Two **straws in the wind:** A 200,000-bbl. slug of gasoline reportedly has moved by pipeline and barge from the soft Mid-Continent market to the Mississippi and down into the gulf. With all the handling costs involved, a below market netback at the refinery is obvious. It underscores the oversupply in the Mid-Continent. The Gulf Coast market, meanwhile, is getting softer with 10 cargoes reported now available there for movement over the next month. Spot price to jobbers in the Mid-Continent is still mostly 10.50 cents per gallon for 91-octane. On the gulf, spots are 10.25 for 90-octane, 10.50 for 92, and 11.50 for 98.

East Coast gasoline markets are quiet except in areas where the Sun and Gulf pricing experiments continue to prove unsettling. Dealer tankwagon prices dropped to about 5.5 cents in Buffalo and Norfolk-Newport News. The Indianapolis market has remained static for a week at 9 cents below normal pump prices.

Heating oil prices remain quiet and steady as the calendar brings their season inevitably closer. Prices are firm on the gulf at 8.5 cents per gallon and steady in the Mid-Continent at 7.75 to 8 cents. Some price shading is reported in New York Harbor, but large-scale movement of distillates is not reported from any market yet.

Remember the beating oil companies took in the press last winter when heating oil prices were raised? Well, Mobil acted last week to try to prevent a recurrence in the coming heating season. Mobil officials in New York and Boston met oil and business writers to explain how the company prices fuel oil. When seasonal increases occur, the hope is that reporters will be able to place them in better perspective.

Serving the HEART of the Petroleum Industry

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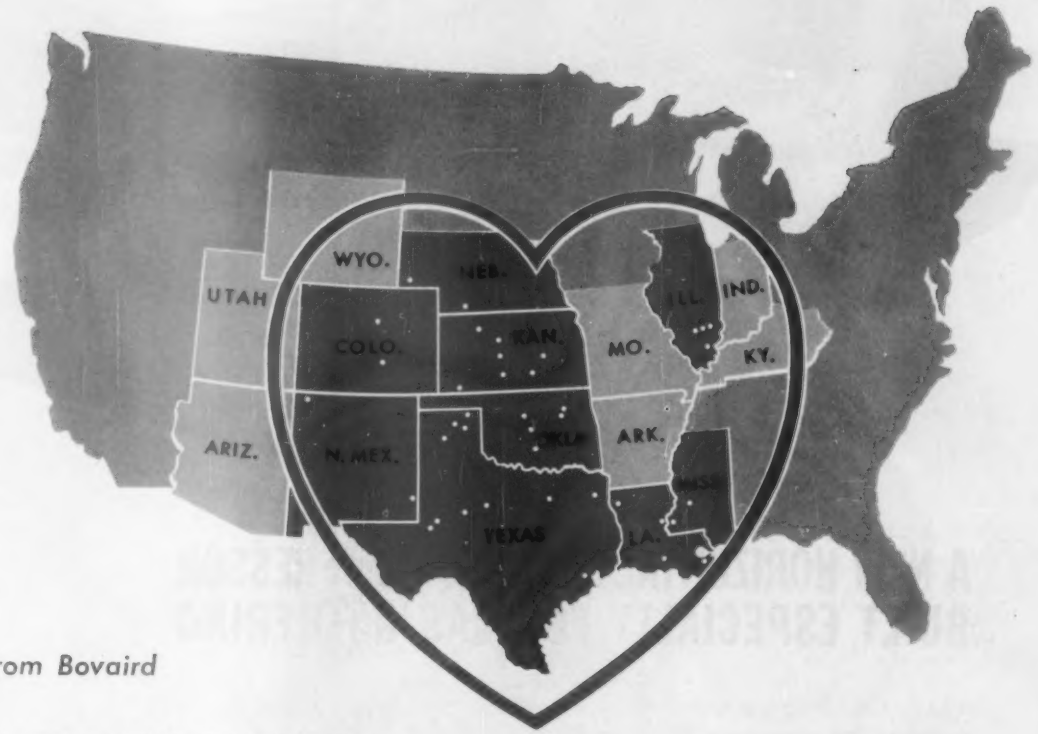

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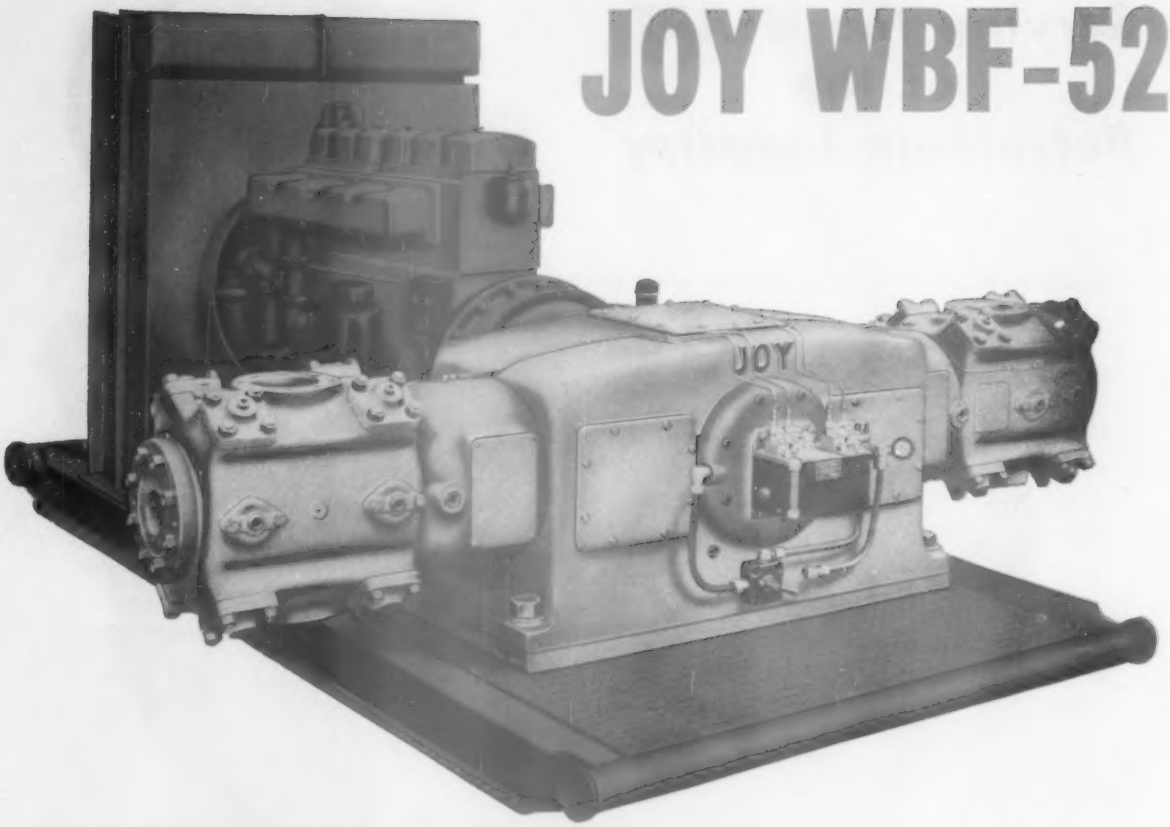

A NEW HORIZONTAL OPPOSED COMPRESSOR BUILT ESPECIALLY FOR GAS GATHERING

The Joy WBF-52 is a heavy duty, two cylinder horizontal opposed packaged gas compressor. Based on Joy's many years of experience in the oil and gas fields, the WBF has all the features demanded by the economics of the gas handling business. The compressor, direct connected to a 1000 rpm natural gas engine, is complete with scrubbers, coolers and controls, all mounted on a sturdy oil field-type skid. The unit is completely portable and may be installed on barges, trailers, slabs or piling because of its inherently smooth running characteristics.

If you encounter changing field conditions of capacity or pressure, simple changes of clearance plugs or cylinders can be made. Many different cylinders may be mounted on the same basic frame with complete interchangeability. These features, plus simple conservative design mean long service under the most rugged field conditions. Consult your nearest Joy fabricator for complete information on the new WBF-52 compressor package.

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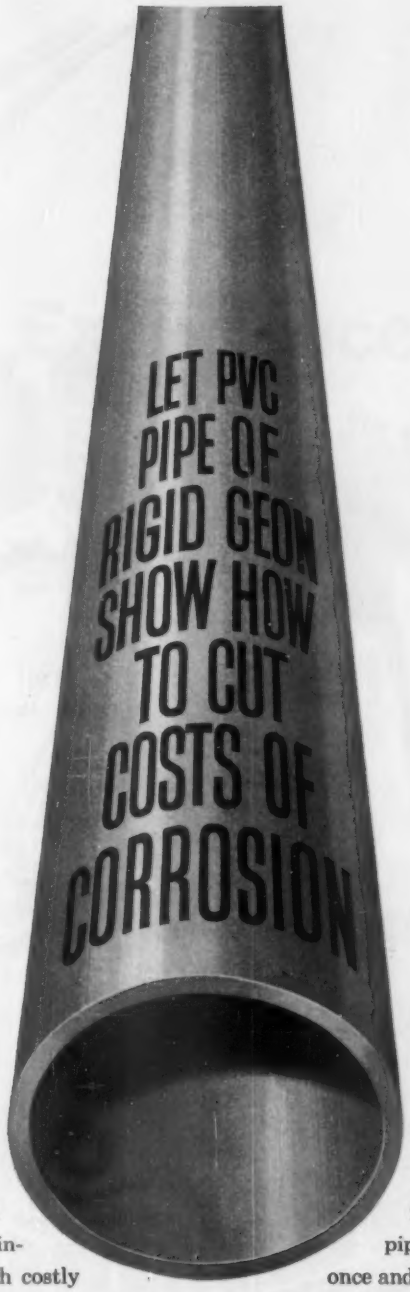

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One look at your records should tell you how much it costs in pipeline maintenance and replacement to deal with costly corrosion. Then it is easy to measure how to save by eliminating corrosion at the start—by using pipe made of rigid Geon vinyl.

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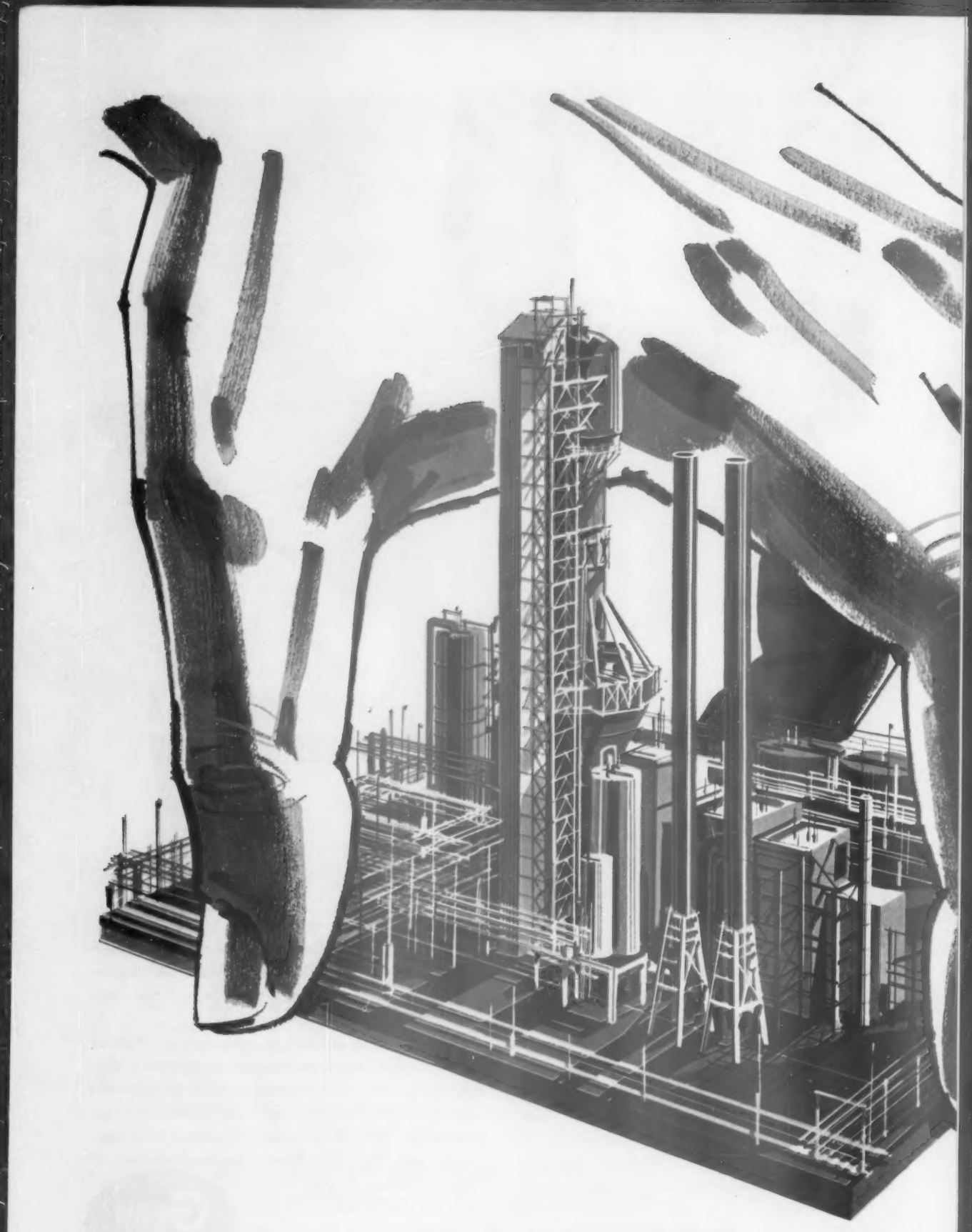

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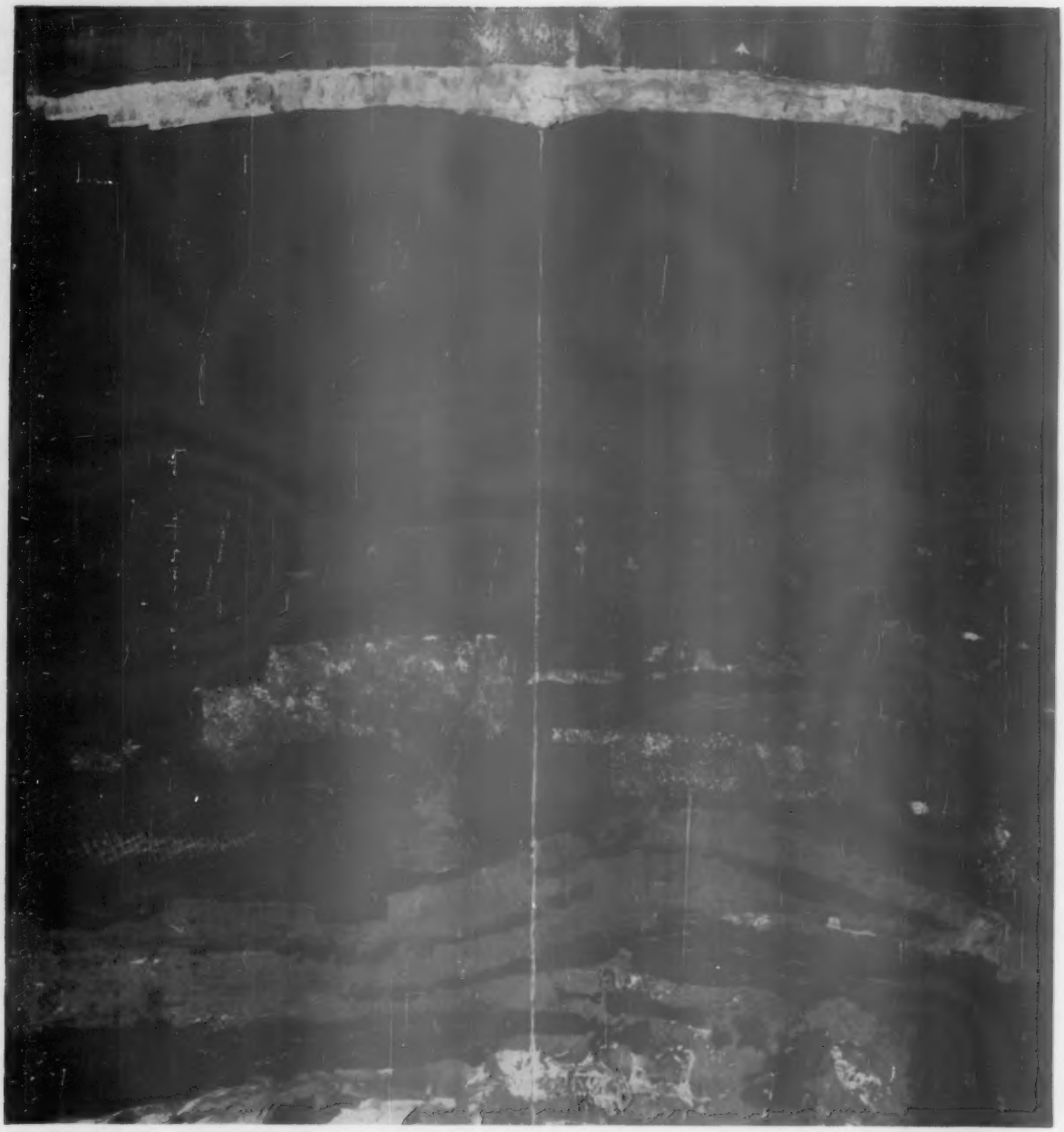

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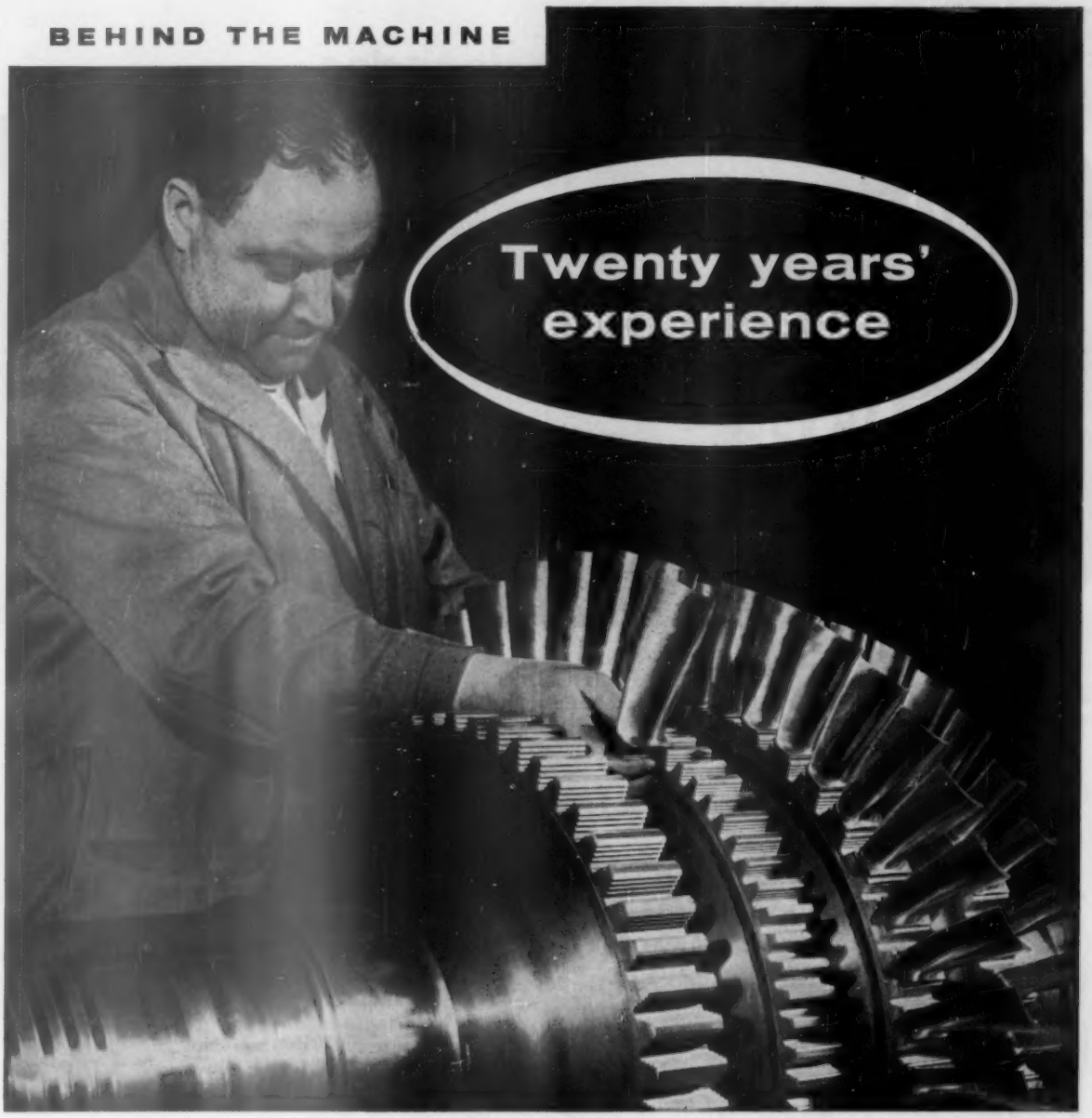

Advanced designs; a wide range of types and sizes; high performance figures; these are the results of over twenty years' experience of design, research and manufacture of gas turbines by AEI engineers.

AEI gas turbines have been installed in aircraft and merchant ships and in frigates and destroyers of the Royal Navy. Industrial machines are suitable for every mechanical drive application as well as power generation, and they have output ratings of 1,750 kW and upwards.

The picture shows work on the rotor of an L21C gas turbine being built for the Basrah Petroleum Co. Larger machines of similar design —the L51C—were recently installed in Iran to supply power for the electrification of the Gach Saran oilfield.

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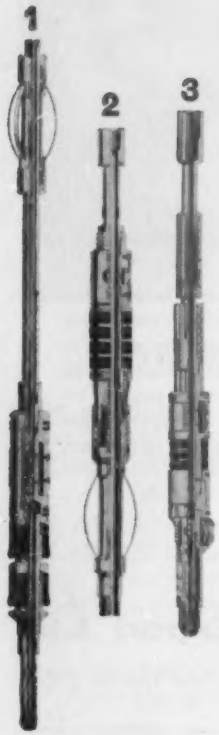
for over three decades . . .

HALLIBURTON CONTINUES TO LEAD IN PACKER IMPROVEMENTS

Achieving the exacting results demanded in today's search for more economical production from deeper drilling, has required a long line of improved packer design. Treating, testing, and squeezing operations in particular demand the utmost in packer dependability. In meeting this demand over the years, Halliburton has introduced these

major breakthroughs in packer design



1 HALLIBURTON *HRP RETRIEVABLE PACKER*

made its bow in the early thirties to give the industry a dependable shoe-type squeeze packer with much less material to drill out as compared to previously-used long straddle packers. The big innovation on this tool was hydraulically-operated slips that took an even firmer bite on the casing as squeeze pressures increased. It was (and still is) a good design, but later years of service pointed to a need for greater flow capacity through the packer, so . . .

2 HALLIBURTON *HM HYDRO-MECHANICAL PACKER*

was introduced. This design (so popular that improved descendants are still in service today) was the first to use mechanical slips to help prevent downward movement during setting operations, plus hydraulic slips to help prevent upward movement as pressure against the packer rubbers increased. These button-type hydraulic slips did a good job (many manufacturers are still satisfied with them), but higher pressures demanded more holding power. Halliburton answered this need with the HM Type H Packer utilizing long, rectangular hydraulic slips to get a tighter, surer grip on the casing. About the same time, Halliburton introduced the . . .

3 HALLIBURTON *HRC HYDRAULIC RETRIEVABLE CEMENTER*

This tool matched the requirements for ever-increasing squeeze pressures by utilizing hydraulic setting to permit harder, more durable packer elements to be used at any depth. Another improvement was that the Circulating Valve for this tool could be opened at any time without unseating the packer. With time, however, the increased volumes to be pumped for treating and fracturing brought about the need for a larger opening through the tool. The answer: a full-opening tool which can handle fluid as fast as the tubing on which it is run. It's called the . . .

4 HALLIBURTON *RTTS (Retrievable Test-Treat-Squeeze) PACKER*

It is the most advanced, universally-accepted multiple purpose tool in service today. All these advanced features – pioneered by the earlier Halliburton tools – are part of the RTTS . . . plus a few new ones all its own.

Halliburton RTTS Packer helps save rig time while treating . . . testing . . . and squeezing in several zones during only ONE trip in the hole. Simply run this versatile packer with circulating valve ports open for fast flow-through to the desired depth. Rotate tubing only ¼ turn to the right and the tool sets the lower mechanical slips to resist setting weight. Applying weight closes the circulating valve and sets the *rubber packer sleeves* – a newly adopted system which provides a better fluid-tight seal than the compression rings in earlier models.

Pressuring up through the Full-Opening Mandrel – wide enough to minimize pressure drop and allow passage of wireline tools – applies pressure through ports below the expanded packer into a fluid chamber to actuate the *large-area rectangular slips* to more effectively resist even the highest squeeze and treating pressures.

A positive shut-off *sliding sleeve-type* integral Circulating Valve opens or closes whenever needed. A Halliburton Retrievable Valve Tester which can be run with the tool provides formation testing information . . . and a tension-sleeve safety joint provides a release for tubing when unusual well conditions occur. Halliburton designed this packer to unseat simply and re-set in other zones whenever needed without round-tripping.

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SPECIAL TOOLS SERVICES

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4
RTTS PACKER
SLIDING SLEEVE CIRCULATING VALVE
Positive fluid shut-off results when sliding sleeve packed off by O-rings moves over ports in valve.
FULL OPENING MANDREL
This packer provides a wide enough opening for fracturing or treating without severe pressure loss from narrow openings . . . it also permits running wireline tools without removing the packer from the hole. Restricted openings in earlier packers wouldn't allow wireline tools to pass through the mandrel . . . thus they also restricted fluid flow for less effect on the formation.
FLUID TIGHT RUBBER PACKER SLEEVE
This system was adopted since larger area of contact retained high pressures better than the compression rings previously used.

Women are always punctual (when they fly Braniff)

Arriving at your destination on time is almost a promise when you fly Braniff. Braniff—as veteran passengers will tell you and government statistics prove—is a leader in on-time records.

"On-timeliness" is just one of many Braniff bonuses. Consider, for example, our Silver Service meals . . . the "looked-after" feeling you get from charming Braniff hostesses . . . and all the other friendly Braniff folks who serve you from start to destination. Yes, and the luxury of Braniff's new El Dorado Super Jets.

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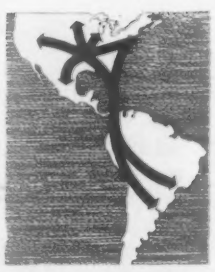
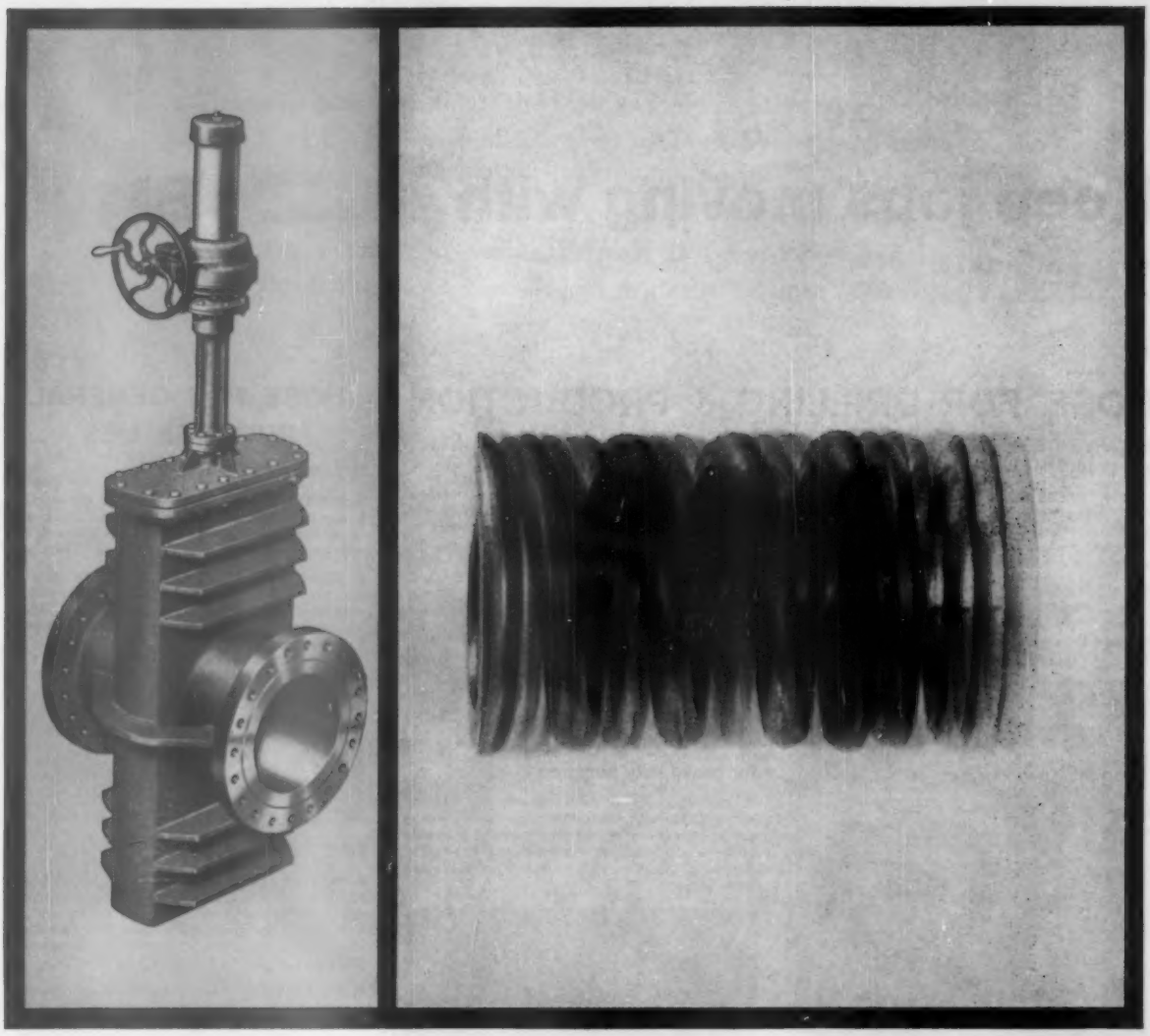


BRANIFF *International* AIRWAYS

General Offices: Dallas, Texas



Crane fabricated pipeline valves with the seal that springs into action.

Mounted in any position, Crane's new 150 and 300 Pound fabricated steel conduit pipeline gate valves deliver smooth, turbulence-free flow, and positive, bubble-tight shutoff. This positive, leakproof closing is due to Crane's unique spring-action, floating seal.

Here's how the seal works: Spring-loaded seat ring plates press seat ring against disc for the primary seal. Line pressure forces disc tightly against downstream seat ring, and achieves a double sealing action by forcing the upstream seat ring against the disc. As an added safety feature, spring control permits excessive pressure in the valve body to bleed off into the line.

Incorporating field tested and proven features developed for Crane's 400 and 600 Pound cast steel full-way conduit-type gate valves – the new Class 150 and 300 fabricated steel valves are first choice for every petroleum and gas pipeline service.

Available 14" to 30" with flanged, butt-welding or flanged-by-welding ends. Catalog Nos. 150 pound–1190TF (flanged), 1191TF (butt-welding); 300 pound–1390TF (flanged), 1391TF (butt-welding). Meet all applicable ASA and API specifications. With handwheel, bevel gear, electric motor or cylinder operator.

For complete details contact your Crane Distributor, or write: Crane Co., Industrial Products Group, Dept. G, 4100 So. Kedzie Ave., Chicago 32, Ill. In Canada: Crane, Ltd., 1170 Beaver Hall Square, Montreal.

AT THE HEART OF HOME AND INDUSTRY

CRANE

VALVES AND PIPING
ELECTRONIC CONTROLS
PLUMBING
HEATING • AIR CONDITIONING

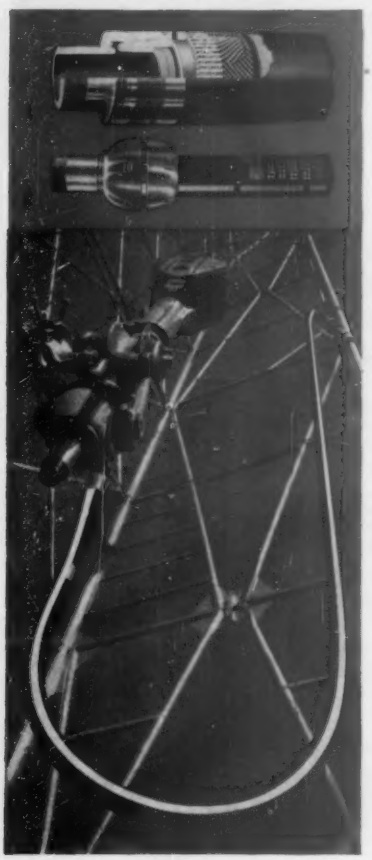
Keep jobs moving with THERMOID Big T

HOSE FOR DRILLING & PRODUCTION

ROTARY HOSE for slim hole and production drilling

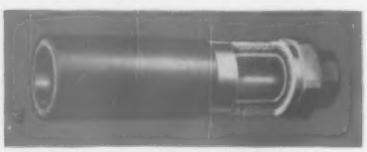
1. POWERFLEX GOLD STRIPE. Proof-tested to 7,500 lbs. pressure for safe operation at any pump pressure, with plenty of reserve strength to prevent blow-outs. Extra-heavy abrasion-resistant cover. Sizes 2½" to 4".

2. TRIOFLEX. Cover of tough, oil and grease resistant synthetic rubber. Wire braid reinforced. Proof-tested to 2000 lbs. Unusual flexibility and resistance to kinking permits coiling in 36" coil. Lengths of 25' to 50'. Sizes 2"-3".



BLOWOUT PREVENTER HOSE for all pressure operated units

3. Wire braid construction and special pressed on couplings provide more than ample safety margin for handling any pressure found in operating blowout preventer equipment. In 1" 2-braid or 1¼" 3-braid.



SLUSH PUMP SUCTION HOSE for heavy duty pumping

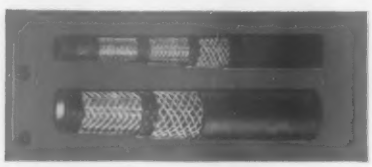
4. MUDFLO. Thick inner tube firmly bonded to a strong, open-weave breaker fabric. Heavy galvanized round wire reinforcement prevents collapse, affords maximum flexibility, absorbs pumping vibration and provides unobstructed flow. Sizes 4" to 12".

HOSE FOR GENERAL PURPOSE USE

STEAM HOSE

5. SUPER-IRONSIDES. Designed for extra heavy duty with 388°F. steam at 200 lbs. pressure. Kink-proof and flexible. Steel braid reinforced. Lengths to 50' in ½" to 2" sizes.

6. IRONSIDES. Handles 366°F. steam at 150 lbs. pressure. Braided steel wire construction with steel wire braid reinforcement imbedded in heat-chemical resistant synthetic rubber. Lengths to 50' in ⅜" to 1" sizes.



FIRE HOSE

7. PORTER D. J. DELUXE. Double-jacketed 100% synthetic hose designed specifically to resist mildew and rot . . . can be repacked wet, ready for immediate use. First bonded all-polyester fiber double jacket. Test pressure 600 psi. Lengths to 50'. Size 1½"-2½".

8. PETROCHEM. First hose designed specifically for oil and chemical industries. It is 100% polyester fiber jacketed for high pressure service under oily and abrasive conditions. Resists heat to 300°F. Sizes 1" to 2½".

9. SUPER-QUAFLEX. All-neoprene tube is completely oil resistant. Lightweight, flexible and easy to handle. Will not kink and can be recoiled with a minimum of effort. Factory Mutual approved. In 1½" and 2½" sizes; 50', 75' and 100' lengths.

YOUR THERMOID BIG T DISTRIBUTOR HAS A COMPLETE LINE OF RELATED INDUSTRIAL PRODUCTS . . .

including Thermoid multiple V-belts, brake blocks, brake linings, clutch facings, clutch friction discs and gear tooth facings.

Hose

Thermoid hose withstands the most rugged operating conditions in the petroleum field . . . keeps production on schedule by reducing down-time to an absolute minimum. Your Thermoid Big T distributor can quickly supply the specific hose you need to fill any application in the petroleum field. For information, write Thermoid Division, 200 Whitehead Road, Trenton 6, New Jersey, or phone JUniper 7-3000.

Quaker Thermoid

HOSE FOR PETROLEUM DELIVERY

FLOATER HOSE
for offshore delivery

10. 100% synthetic construction for maximum resistance to salt water, petroleum based products and extreme temperatures. "D" rings spaced along hose for attaching inflatable Thermoid pontoons. Hose is available in continuous lengths in sizes 3" to 10" and in working pressures of 130 to 200 psi. Pontoons are 100% synthetic construction with nylon cord reinforcement.

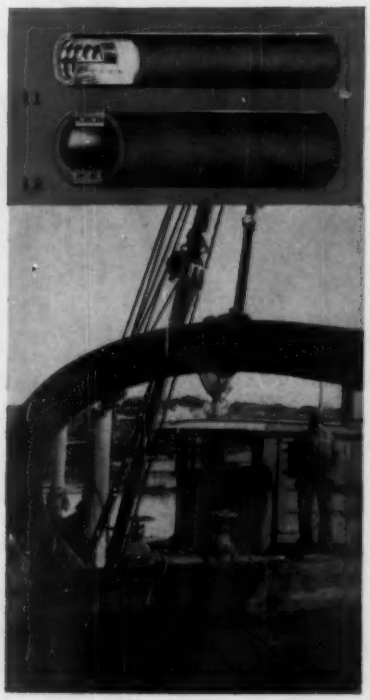
SUBMARINE HOSE
for ship to shore delivery

VICTOR. Toughest construction of any hose made. Has long life in spite of the most rugged operating conditions in the industry. Flexibility meets tanker motions easily. Withstands working pressures of 250 lbs. Has built-in heavy-duty steel nipples and welded steel flanges. In 25' lengths, 12" size.

SUCTION AND DISCHARGE HOSE
for oil and gasoline

11. POWERFLEX. Designed for conveying aromatic solvents. Guaranteed for 2000 hours of service. In sizes 3" through 12".

12. EBONITE. Multiple plies of strong, closely woven heavy-duty duck, frictioned with high grade rubber compounds for firm bonding and high burst resistance. Lengths to 50'; sizes 3" to 12". (Also available in "Quaflex" grade with nylon cord reinforcement.)



PORTER

THERMOID DIVISION
H. K. PORTER COMPANY, INC.
200 WHITEHEAD ROAD, TRENTON 6, NEW JERSEY

The "OILWELL" string . . . PRODUCTS SERVICES STORES

Every sucker rod a stretcher case?

We can't resist saying "stretcher case" because it refers to an "Oilwell" exclusive in sucker rod manufacture. Only "Oilwell" *stretch-straightens* rods (grades "Y," "T" and "O"), while at tempering heat. Why? To avoid introducing internal stresses that can be caused by cold straightening; and to cull out rods with surface defects (which show up most clearly when the rod is hot stretched).

Hot stretch-straightening is only one of the many reasons why "Oilwell" sucker rods are the most dependable you can buy. And you can choose from five different grades of "Oilwell" rods tailored for specific well conditions:

Grade "Y" for corrosive-inhibited deep wells. These boron-containing rods are "shot peened" as well as liquid quenched, over their entire length. They have both toughness and strength to give maximum service in corrosion-inhibited wells or wells having mild sulphuric brines.

Grade "T" for combatting embrittlement due to sour environment. Liquid-quenching and tempering of this low carbon, nickel content rod increases its fatigue resistance and improves service life in sour wells.

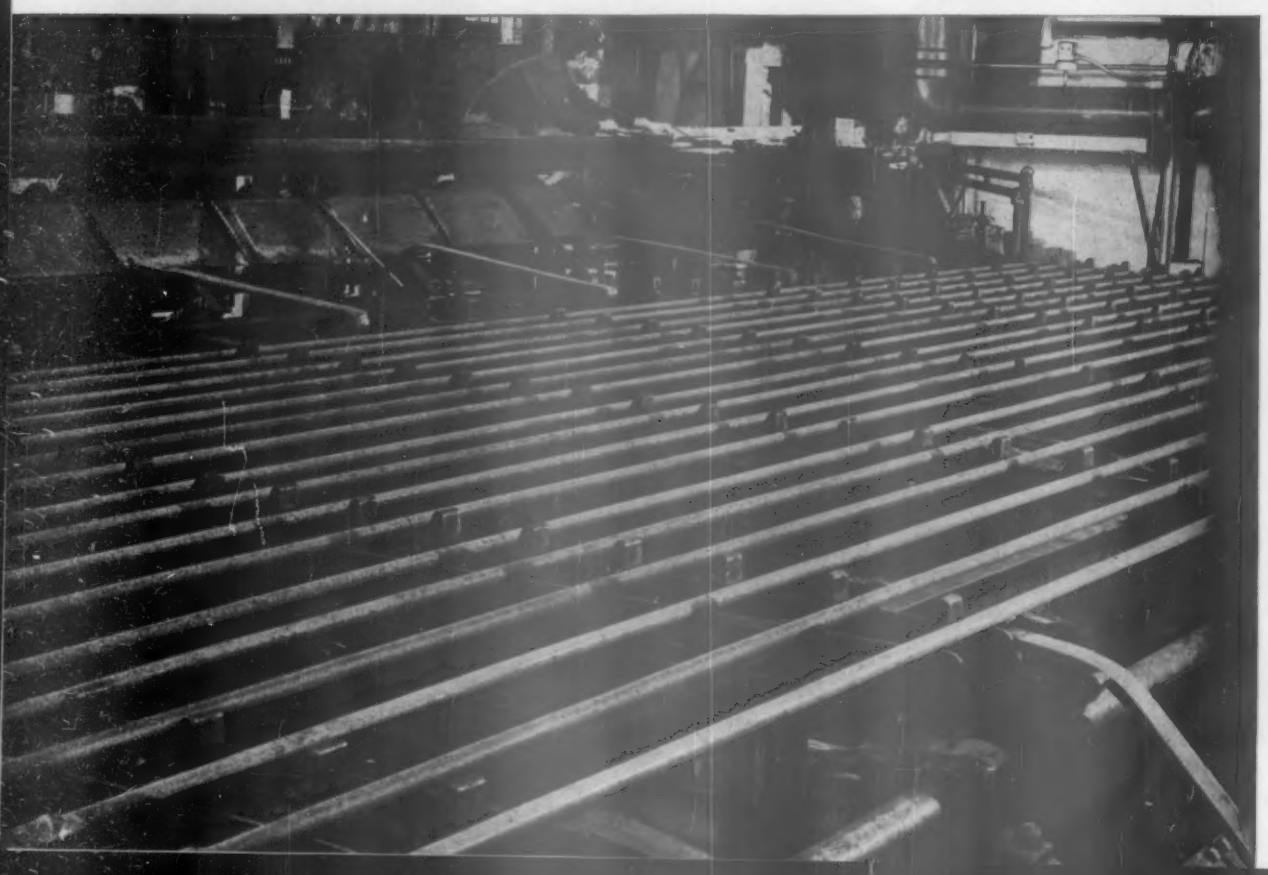
Grade "O" A new "Oilwell" Sucker Rod made of boron alloy steel. Liquid-quenching and tempering imparts exceptional resistance to fatigue under heavy loads. It also performs well under hydrogen embrittlement conditions where inhibitors are used to reduce pitting action.

Grade "L" for carbon dioxide corrosive conditions and medium-to-heavy non-corrosive wells. Made of fully normalized and tempered special nickel-chromium alloy steel, these rods have a "pearlite" grain structure having excellent resistance to carbon dioxide corrosion. Their long runs contribute to a big reduction in pulling costs.

Grade "N" for non-corrosive or inhibited wells. After bar stock has been roll-straightened and rod ends have been formed, these API-"C" rods are normalized to obtain optimum strength, toughness and resistance to shock and fatigue. Will give superior performance in non-corrosive or inhibited wells.

Any well can be pumped economically with one of the five "Oilwell" sucker rods described above. If you want more information, we suggest that you talk to the manager of the "Oilwell" store in your area.

USS and "Oilwell" are registered trademarks



Pump repair where you need it

When you're faced with the repair or reconditioning of any subsurface pump, just get it to the nearest "Oilwell" pump shop. These shops, located for the convenience of our customers, carry complete stocks of quality parts, are equipped with modern tools, and are staffed by experienced pump men. You will find "Oilwell" subsurface pump maintenance service completely satisfying . . . in the quality of the work we do . . . and in its surprisingly reasonable cost.

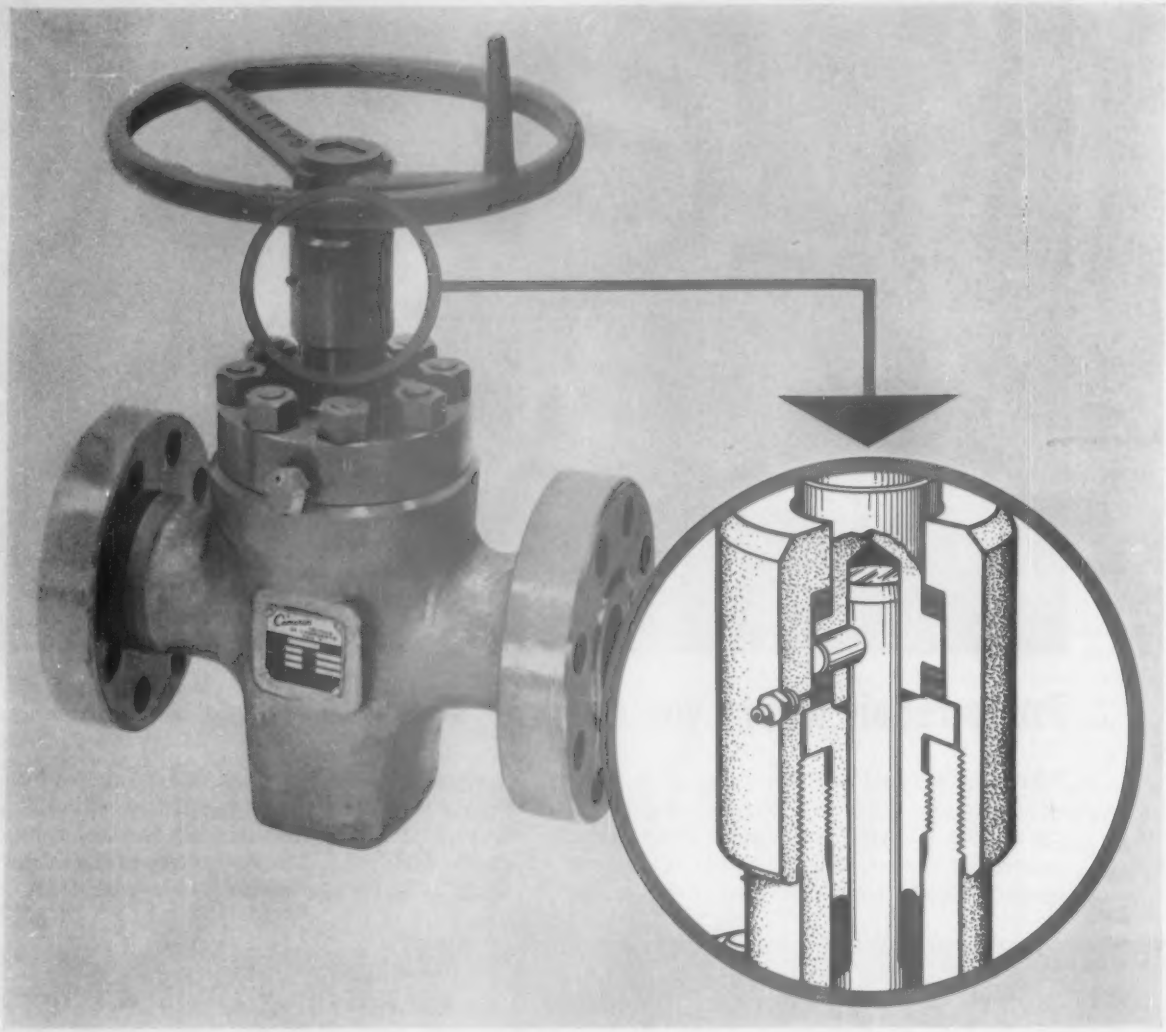
Where there's oil — there's "Oilwell"

Every dot on the map represents an "Oilwell" store. There's one near practically every important drilling, production, pipeline or processing operation. One is probably within an hour's drive of you now. And there's always stock not more than a night away! The managers and personnel of these conveniently located "Oilwell" supply stores give you not only fast service, but they can usually help with out-of-the-ordinary problems.

USS

Oil Well Supply Division of United States Steel

Executive and Export Offices: Dallas, Texas



SAY GOOD-BYE TO FRICTION

Cameron's exclusive Type "J" packing now used in Type "F" Conduit Gate Valves has so little friction we are tempted to say "Good-bye to stem friction." Flexible Teflon, squeezed against metal surfaces by synthetic rubber, holds high pressure with almost no friction. Two needle bearings carry the thrust on the stem and that is another reason Cameron Type "F" Gate Valves are so easy to open and close.

Whether your problem is erosion, mild corrosion or very severe corrosion, one of Cameron's valve trims will give you outstanding service. Forged valve bodies and bonnets have superior grain structure and toughness making them the safest valves available. Long operating life without leakage is assured by the time-tested rotating seat design. When servicing eventually becomes necessary, the gate and seats are easily removed without special tools and without removing the valve from the line. It is no wonder that Cameron Type "F" Gate Valves are used on more and more Christmas trees.

Cameron

CAMERON IRON WORKS, INC.
P. O. BOX 1212 HOUSTON, TEXAS

PROVED in 50 million feet of installations, this plastic coated steel pipe takes to the most corrosive soils. Saves you time and money. X-TRU-COAT is available from the pipe mill in all sizes from ½″ through 8⅝″ O.D.

HOW TO FINISH IN THE MONEY ON A MUDDY TRACK, 43 MILES LONG

Phillips Petroleum Company, Bartlesville, Oklahoma, recently installed a 6-inch products line between their Chocolate Bayou plant and processing plants in Brazoria, Texas.

Republic X-TRU-COAT—*coated at the pipe mill*—kept this installation moving despite frequent showers and severe mud. Naturally, the only bare steel requiring field coating was the cut back area at the pipe end necessary for welding. In addition, the tough plastic coating let Brazos Construction Company, pipeline contractors, string this pipe directly on the ground, then skid it onto timbers immediately behind welding operations.

X-TRU-COAT (with Phillips' own MARLEX® Plastic as the coating) showed no damage as a result of this severe handling. Welded joints were cleaned, wire brushed, primed, and wrapped with 4-inch plastic tape.

X-TRU-COAT is immune to the most corrosive soils. It insulates against electrolytic action and takes shipping, stringing, and installation in stride. Best proof is that customers have used *more than 50,000,000 feet* of this outstanding Republic product in the past four years.

X-TRU-COAT from the pipe mill is available in ½" through 8" nominal. Users state that it can be bought and installed for *less* money than conventionally wrapped pipe. But biggest savings are in longer life. Republic X-TRU-COAT offers the highest known corrosion resistance.

Call your nearest Republic sales office for consultation or quotations. For a picture of a few of the hundreds of current X-TRU-COAT installations, mail the coupon on the following page. A free copy of the new *X-TRU-COAT Brochure* will be sent by return mail.

REPUBLIC STEEL

Cleveland 1, Ohio

Electric Weld • Fusion Weld • Seamless • Continuous Butt Weld

Light Wall • X-TRU-COAT • Plastic Pipe

Steel

Strong
Modern
Dependable

REPUBLIC LINE PIPE: ⅛" TO 30" O.D.

Expanded Electric Fusion Weld in 24", 26", and 30" O.D. Lengths: random (approximately 30') and double random (approximately 60', mid-welded). Specs: ASTM, API. Grades: X-42, 46, 52, 56, and 60. End finish: plain end beveled, plain end square cut.

Electric Resistance Weld in 1.315" through 16" O.D. Standard, extra strong, and light wall. Black and galvanized. Lengths: single, double, ½ and ⅓ random lengths, and cut lengths. Specs: ASTM, API, U. S. Federal, etc.

X-TRU-COAT Plastic Coated Steel Pipe in ½" through 8⅝" O.D. Electric Resistance Weld and Continuous Butt Weld. Standard, extra strong and light wall. Can be applied to either black or galvanized pipe. Uniform 21' lengths, cut lengths, single and double random lengths. End finish: threaded and coupled, threaded, plain end beveled, square cut or grooved for Victaulic Couplings.

Continuous Butt Weld in ⅛" through 4". Standard and line pipe. Threaded and coupled, threaded, plain end beveled or square cut. Standard, extra strong, double extra strong. Uniform 21' lengths, cut lengths, single and double random lengths. Specs: ASTM, API, U.S. Federal, etc.

SRK® Plastic Pipe (ABS Type I, IA and II) in 20' straight lengths. 100 lb.—2" through 6"; 150 lb.—½" through 6"; standard and extra heavy IPS—½" through 8"; AGA size—½" through 6" (Subcommittee Report DMC-56-16).

SRB® Plastic Pipe (Semi-Rigid Butyrate) in 20' straight lengths. 2" through 4" in standard SWP weights.

Fe® Plastic Pipe (Flexible Polyethylene) in the following weights and sizes: standard—2" through 6", 75 and 100 lb.—½" through 2". 4" and 6" sizes in 25' straight lengths. ½" through 3" sizes in coils.

REPUBLIC STEEL CORPORATION
DEPT. OG-2432
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on:

☐ X-TRU-COAT Plastic Coated Steel Pipe ☐ Seamless
☐ Electric Resistance Weld ☐ Fusion Weld
☐ Continuous Butt Weld ☐ Plastic Pipe

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

REPUBLIC STEEL

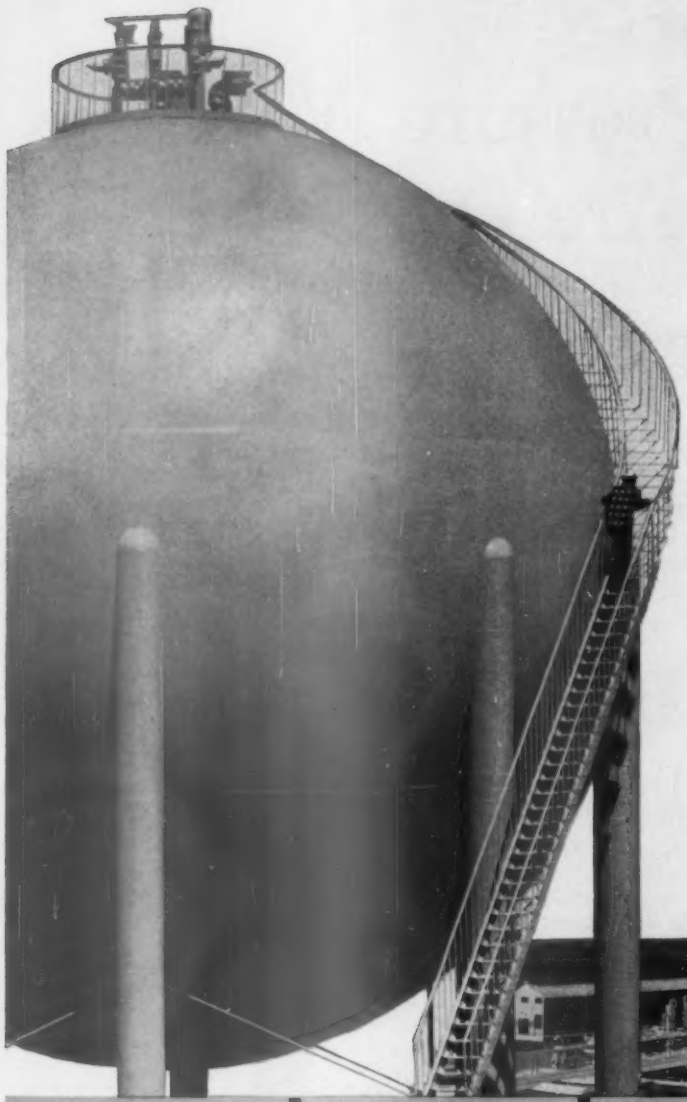
General Offices • Cleveland 1, Ohio

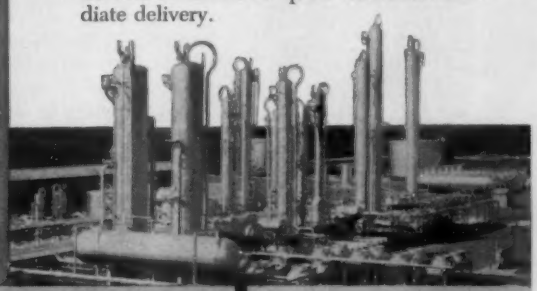
Tough, colorful, lasting beauty!

Take those pumps and rigs in the oil fields—or those tanks and pipelines in the refineries! Each needs the tough, colorful, lasting beauty that Rust-Oleum provides. If the surface is rusty, Rust-Oleum 769 Damp-Proof Red Primer can be applied *right over the sound rusted surface* after removing rust scale and loose rust. Special Rust-Oleum Oil Field Finishes match the original equipment colors on pumps and rigs — while other long-lasting Rust-Oleum coatings protect costly tanks and pipe lines.

They're specially made for oil field use — tough, flexible, easy-to-use on the spot by brush or spray! They dry to firm, glossy finishes that resist sun, fumes, heat, moisture, weathering, and blowing dust and sand.

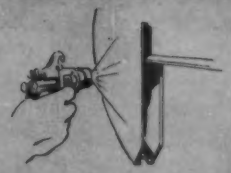
Try Rust-Oleum . . . your Rust-Oleum Distributor maintains complete stocks for immediate delivery.



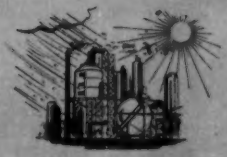


Apply Rust-Oleum 769 Damp-Proof Red Primer directly over sound rusted surfaces.

Follow-up with the Rust-Oleum finish coating in the color of your choice



By brush or spray — the Rust-Oleum system provides tough, colorful, lasting beauty.



Dries to a firm finish that resists sun, fumes, heat, weathering, and blowing dust and sand.

RUST-OLEUM®

There is only one Rust-Oleum. Distinctive as your own fingerprint.

STOPS RUST!®

Mail coupon today for FREE TEST SAMPLE

RUST-OLEUM CORPORATION

2580 Oakton Street, Evanston, Ill.
Dallas Branch: 3200 McKinney, Dallas, Tex.

☐ Free test sample of 769 Damp-Proof Red Primer to be applied directly over sound rusted surfaces.

☐ Complete literature with color charts.

Mr. Drilling Contractor

Your Pressure Worries Are Over!

Goodall proudly announces two ALL-NEW rotary hose S-7500 Super Long-Life ...and the revolutionary S-10,000 ULTRA Long-Life

Goodall, first with every worthwhile rotary hose development, now puts an end to your pressure worries with two completely new types of hose. You've heard about this amazing hose from your friends. Now, with complete performance data and a full supply of hose, we can offer Goodall S-7500 Super Long-Life and S-10,000 ULTRA Long-Life Rotary Hose for sale through your supply store.

Goodall S-7500 Super Long-Life is a premium cable hose at the regular price. It is **the** rotary hose for working pressures up to 4000 lbs.

For working pressures above 4000 lbs., you need the new ULTRA Long-Life hose. It costs more to make, it costs more to buy—but it's worth every penny. Supply is limited; please order ULTRA Long-Life cable hose in advance of your needs. Available in 3″ hose sizes only.

These new Goodall rotary hose are products of years of research and equipment development. Manufactured with completely new machines, they are masterpieces of perfect balance. The type of cables, the angle of the cables, gasket materials, weight of couplings—all are new.

Now you can use the high pressure capacity of your pumps, or conform to oil company test procedures, without a worry about exceeding the rotary hose working pressure. And, because these hose have substantially more reserve strength, they give you **bonus longer life.**

You always get the advantages of the Goodall unconditional one-year guarantee, the famous Barney Coupling, the Goodall Safety Clamp and the Goodall Repair Service. Call your favorite supply store and specify Goodall!

Goodall has been first with every worthwhile rotary hose development

GOODALL
RUBBER COMPANY

A TRIBUTE TO BARNEY

On the occasion of the introduction of this great hose, Goodall Rubber Company gratefully salutes H. "Barney" Barnard for more than a quarter-century of dedicated effort to industry-wide rotary hose improvement.

Photographed at DX Sunray, (Tulsa Refinery)

For higher yield...new Aerocat 3C

CAN YOU USE a higher yield of gasoline—? or of propylenes or butylenes—? Then investigate the new AEROCAT 3C! It's a new fluid cracking catalyst composition, developed by Cyanamid in cooperation with a major oil company. AEROCAT 3C-12 gives increased gasoline yield . . . AEROCAT 3C-20, increased propylene and butylene yields . . . both at the expense of dry gas and coke.

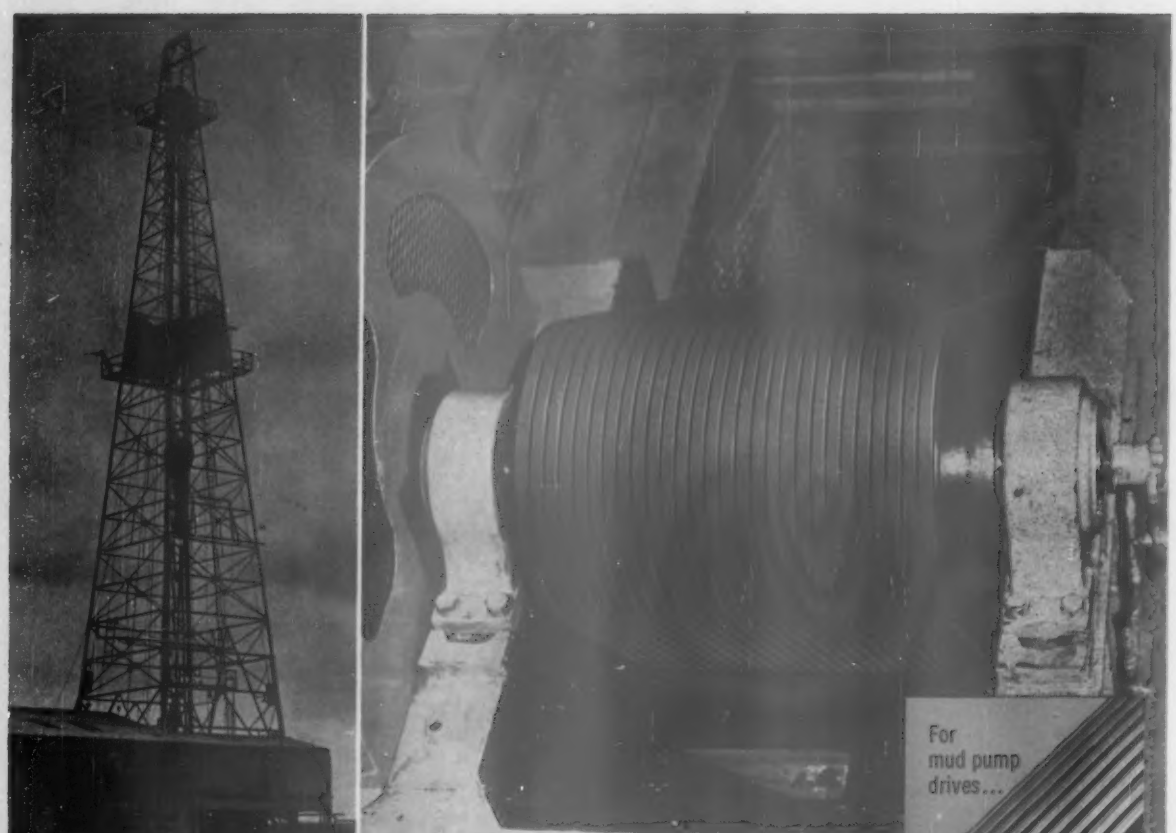
In actual commercial operations, these new three-component catalysts have proved their ability to provide refiners with more flexible, more profitable operation. They are highly active, exceedingly stable, and completely operative.

Your "Man with the Golden Rule"—your Cyanamid salesman—will be glad to work with you to determine the suitability of AEROCAT 3C for your needs. He knows catalysts—and behind him are the resources of a major producer of both catalysts and other chemicals. Why not call him now?

Basic in catalyst chemistry

CYANAMID

AMERICAN CYANAMID COMPANY • REFINERY CHEMICALS DEPARTMENT • 30 Rockefeller Plaza, New York 20, New York



use Gates Super HC Rib Top V-Belts, specially designed to handle the exceptionally heavy work loads and shock and vibration conditions of mud pump service.

Gates Super HC V-Belt Drives save you up to 50% in space, 20% in weight and cost

Because of basic changes in V-belt shape and construction, Gates Super HC High Capacity V-Belts can handle up to 3 times the horsepower of conventional V-belts in the same space. Or the Gates Drive can transmit the same power as conventional V-belts in ⅔ to ½ the space.

With this greater horsepower-carrying capacity, fewer Super HC V-Belts are needed . . . sheaves can be smaller and lighter in weight. This reduces your cost for a V-belt drive by as much as 20%. Drive weight is also reduced about 20%, lowering bearing loads, increasing bearing life. Guards and machine housings can be smaller and lighter in weight, reducing material costs and making portable equipment more compact. Moreover, the Super HC Drive can operate at belt speeds up to 6,000 ft/min without dynamic balancing, often permitting use of lower cost, higher speed engines.

The local Gates Man serving your area is a drive design expert. Contact him for drive design aid and for complete technical information, by calling your nearby Gates-stocked supply house.

The Gates Rubber Company, Denver, Colorado

BP57

Gates

Building the future on 50 years of progress.

Gates Super HC V-Belt Drives

Edward Mudwonder Valves help us drill 'em deeper, cheaper. . ."

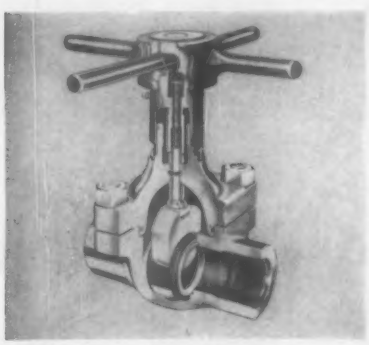
SAYS AL FIELDEN,
TOOLPUSHER,
LLANO DRILLING CO., RIG #5
MIDLAND, TEXAS

"Living up to our motto of drilling wells deeper and cheaper," continues Mr. Fielden, "means we've got to be on our toes in every part of the operation. Equipment selection is a good example.

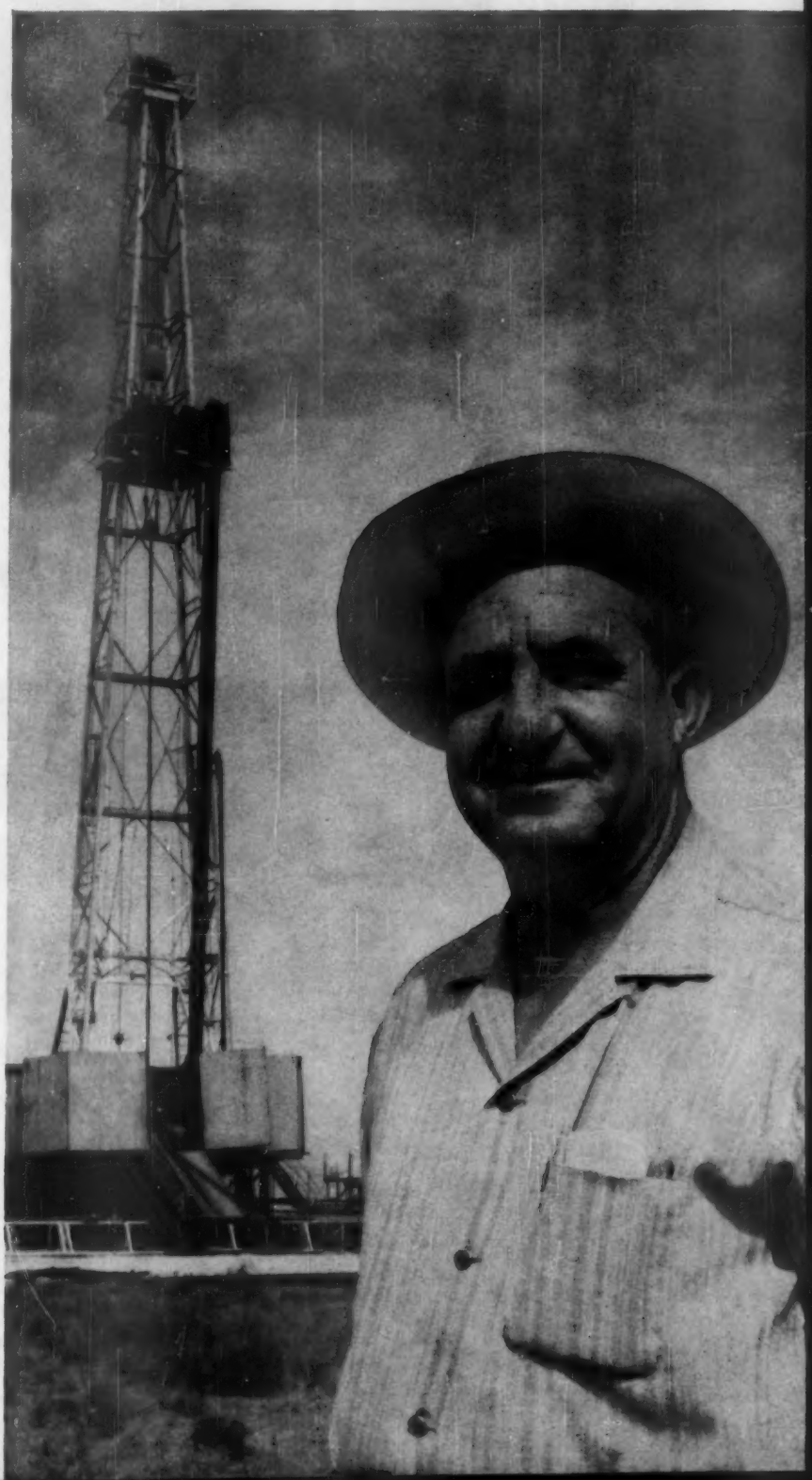
"If a piece of rig equipment is too expensive to operate or maintain, we get rid of it—fast. So many unpredictable things can happen in the hole itself that we just can't take additional risks with undependable equipment above ground.

"In the case of mud valves, we settled on Edward Mudwonders about three years ago. We found that they were reliable, easy to operate, and needed practically no servicing. When our other mud valves wear out, we replace them with Mudwonders."

Edward Mudwonder Valves are built in 2", 3", and 4" sizes, with screwed or flanged ends, for 2000 psi WP (4000 psi test), 3000 psi WP (6000 psi test), and 5000 psi WP (10,000 psi test) service. See your favorite oil field supply store, or write Edward Valves, Inc., 1212 W. 145th Street, East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company. 6021



EDWARD STEEL VALVES
another fine product by
ROCKWELL



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NORRIS
SUCKER RODS
UNDERCUT PIN
ROLLED THREAD
Immediate Delivery All Grades in Sizes
1/2"—5/8"—3/4"—7/8" and 1"
For detailed information see your W. C. Norris sales representative or write for brochure entitled "What About Undercut Pins and Rolled Threads".
Norris continues to furnish conventional API threaded pins in sizes up to 1 1/8".

Target → Longer Service

TYPE 30 Carbon-Manganese fully normalized. For heavy duty where corrosion is not a major problem.

TYPE 40 Nickel-Molybdenum Alloy. Normalized and tempered. For heavy duty pumping in medium corrosive conditions.

TYPE 75 Nickel-Chromium-Molybdenum Steel, normalized and tempered. For extremely heavy duty in medium corrosive fluids.

TYPE 78 Carbon-Chromium-Molybdenum Boron Alloy, normalized and tempered. For heavy duty pumping in non-corrosive or inhibited fluids.

Write for prices and complete literature today!

★ **BUY FROM YOUR NORRIS DISTRIBUTOR**

NORRIS QUALITY
SUCKER RODS
POLISHED RODS - COUPLINGS

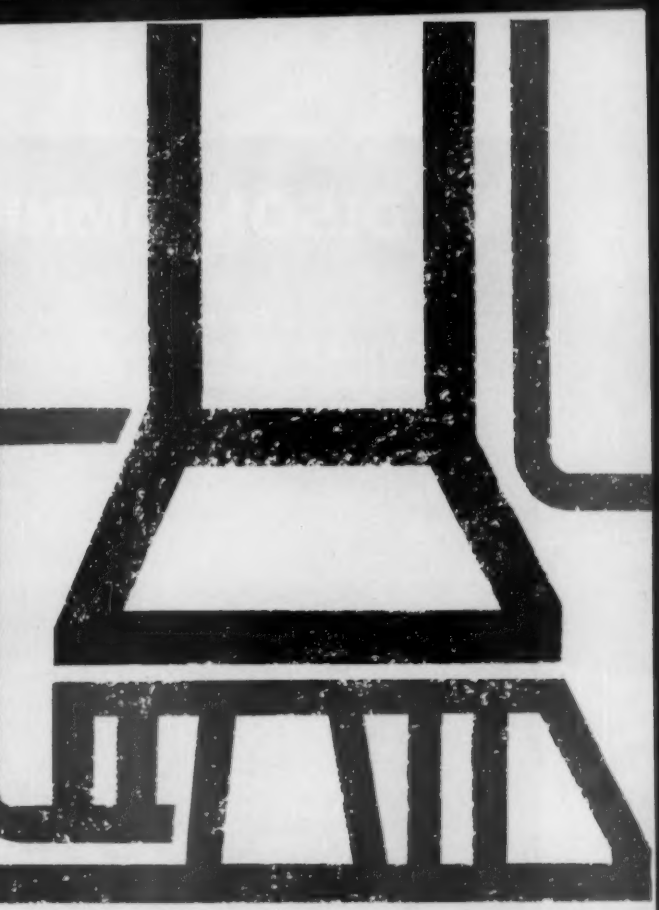
W. C. NORRIS DIVISION
DOVER CORPORATION
P. O. BOX 1739 • TULSA, OKLA.
BRANCHES: Great Bend, Houston, Kilgore, Odessa, Wichita Falls, Salem, Casper, Farmington

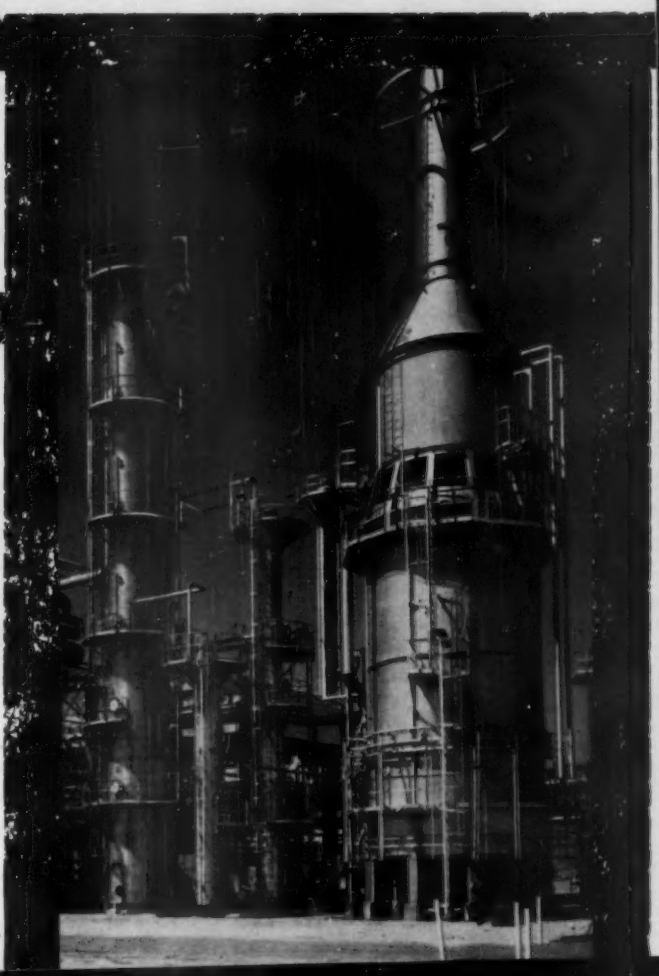
Procon completes African refinery 4 months ahead of schedule

Sixteen months to build a refinery in Mozambique . . . on the east coast of Africa near the port of Lourenco Marques . . . at considerable distances from the industries where almost all the refinery equipment had been constructed.

But build it Procon did! Not in 16 months—but in 12 months. Four months ahead of schedule! A modern 12,000 BSD refinery, it includes Platforming®, Unifining®, Merox™, and crude distillation units plus complete supporting facilities.

On stream for Sociedade Nacional de Refinacao de Petroleos (SONAREP) a subsidiary of the Portuguese petroleum marketing firm, Sociedade Nacional de Petroleos (SONAP), this refinery is another tribute to Procon's proven capabilities... to tackle the toughest job ...and complete it in the shortest possible time.





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DES PLAINES, ILLINOIS, U.S.A.

World-Wide Construction for the Petroleum, Petrochemical and Chemical Industries.

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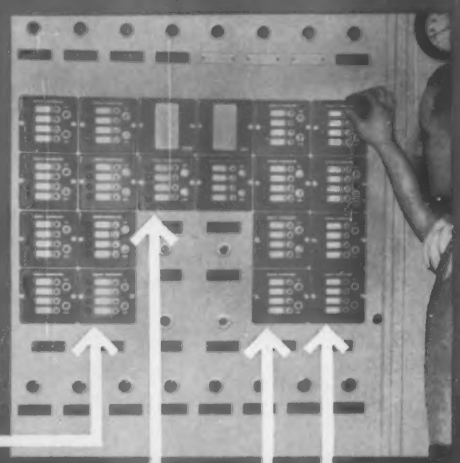
EDISON OMNIGUARD SYSTEM

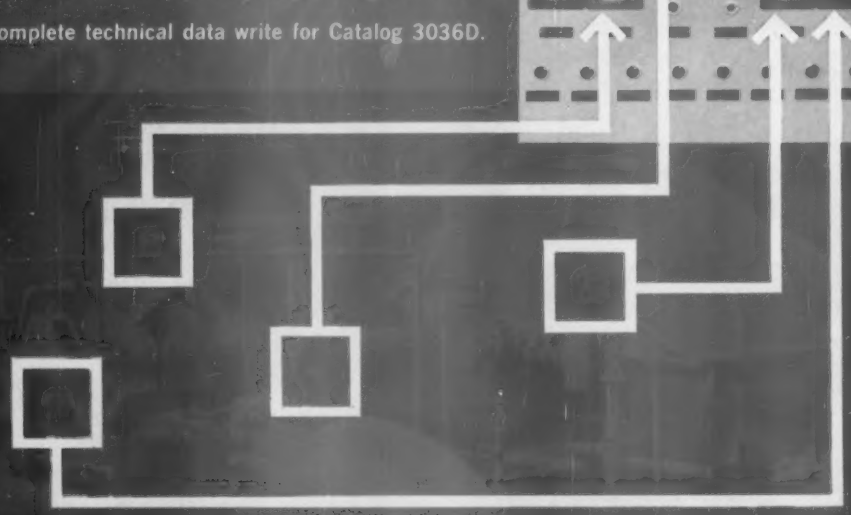
SAFEGUARDS VITAL EQUIPMENT FOR TRANS MOUNTAIN OIL PIPE LINE CO.

Transfer of a quarter-million barrels of crude oil is the tough daily quota set for the four pumps and 1500-horsepower engines at the Trans Mountain station, Edson, Canada. To ensure constant, uninterrupted delivery at this heavy flow rate, Trans Mountain engineers specified an Edison Omniguard system to stand watch over critical temperatures in all vital parts of their pumping equipment.

These key points—engine bearings, engine lube oil and cooling water, geardrive bearings, pump bearings, and pump cases—are vigilantly guarded by Edison Model 313N dual-element detectors with both alarm and automatic-shutdown circuits. Omniguard sounds an alarm and visually pinpoints the trouble spot on the control panel if temperature at any point rises a preset 20° F above normal operating level. If rise continues, Omniguard automatically shuts down affected equipment in time to prevent costly damage.

For complete technical data write for Catalog 3036D.





Thomas A. Edison Industries
INSTRUMENT DIVISION
42 LAKESIDE AVENUE, WEST ORANGE, N. J.

THIS GROVE FLEXFLO® REGULATOR IN THE LINE 5 YEARS WITHOUT SERVICE

Handling flow rates from 3 to 5 MMSCF/hr 300 psig to 380 psig inlet, 53 to 55 psig outlet pressures

This 8" model 80-820 Flexflo has been under the above service without maintenance for over 5 years at Pacific Gas and Electric Company's Moss Landing plant. A similar "standby" unit has never been uncrated. There are many case-proven examples of the reliability, dependability and maintenance-free service of Grove Flexflo pressure reducing and relief regulators. Such service, plus the amazing simplicity and versatility of Flexflos, makes them worthy of your consideration. For complete technical presentation, write for Bulletin 800.

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GROVE VALVE AND REGULATOR COMPANY
A subsidiary of Walworth
6529 HOLLIS STREET • OAKLAND 8, CALIFORNIA
Offices throughout the U.S. and in Western Canada

7238

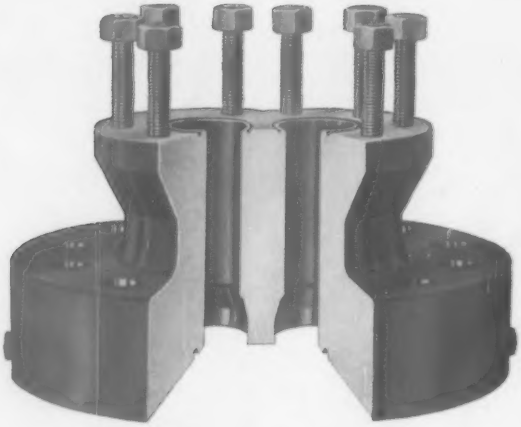
Rector
Multi-String Tubing Heads

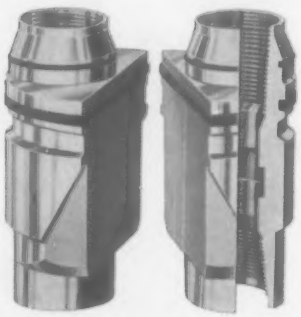
For Maximum Flexibility and Positive Control During All Multiple Completion Operations

From start to finish RECTOR Multi-String Tubing Heads allow full passage of packers and other tools to the oil string. Split hangers are automatically aligned in the head by fixed lugs . . . no guide pin necessary.

Tubing strings are run and landed without removal of blow-out preventers. Positive control of well is maintained by sealing elements on hangers and removable RECTOR-PSI circulating full opening back pressure valves during removal of blow-out preventers and installation of Christmas Tree. A special Rector multi-seal ring on each hanger insures positive steel seal for each tubing string.

Available through your favorite supply store or your Rector representative.





Rector

WELL EQUIPMENT CO., INC.

Making the Oil Industry Safer!

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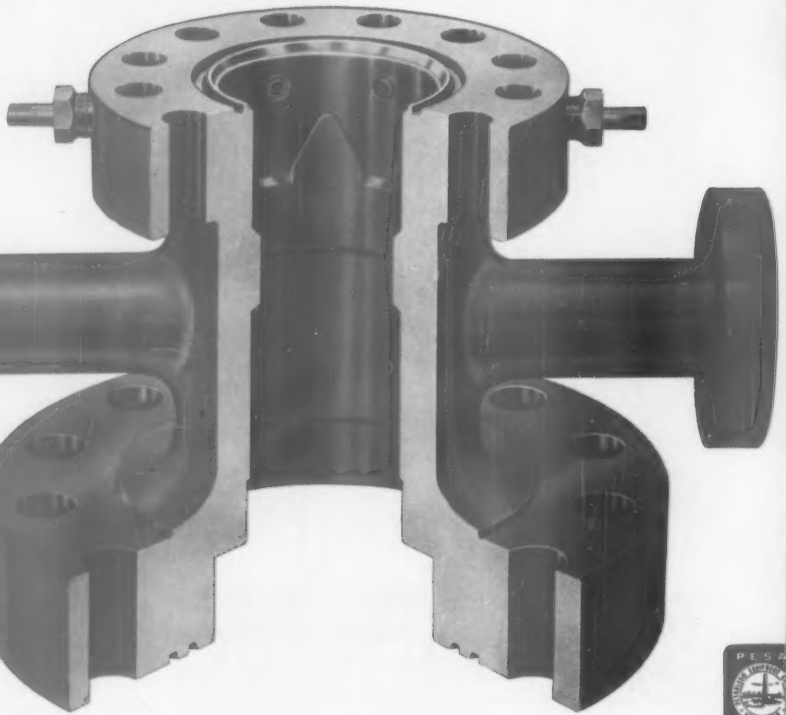


RECTOR DUAL CHRISTMAS TREE

EXPORT REPRESENTATIVES: CONTINENTAL-EMSCO CO., MID-CONTINENT SUPPLY CO., OILWELL DIVISION OF UNITED STATES STEEL CORPORATION

You Asked For It...

MORE BBLs/DAY WITH oilmaster CAVITY BALANCED HYDRAULIC FREE PUMP

Perhaps you were one we surveyed when our pollsters returned a unanimous verdict... **Develop a hydraulic unit that will get more barrels/day with smaller production tubing.**

We've even surprised ourselves. We could write a book or talk for a week about this **volume thirsty hydraulic pump,** but we think the following condensed specifications will tell quite a bit. Would you like to hear more?

FOR THE FULL STORY on Oilmaster Hydraulic Pumping Systems write Fluid Packed Pump, Armco Steel Corporation, 9100 South Norwalk Boulevard, Los Nietos, California.

Tubing Size API	Unit Assembly Number	Bore		Bal. Press PSI per 1000'	Rated Speed	Stroke Length	Bbl/day Capacity at Rated Speed	
		Engine	Pump				Engine	Pump
2⅛"	FB171313	1.300	1.300	433	64	22	268	268
2⅜"	FEB201616	1.600	1.600	433	55	32	517	517
2⅞"	FEB252020	2.000	2.000	433	50	36	825	825
3½"	FEB302424	2.400	2.400	433	42	48	1350	1350

Designed especially for use in casing free installations. Where gas is a problem and casing size permits, an independently landed gas vent string can be used to vent gas from under the packer.

DISTRIBUTED BY: Beacon Supply Company • Dominion Oilfields Supply Company, Limited • Industrial Supply Company • National Supply Division, Armco Steel Corporation • Union Supply Company

ARMCO Fluid Packed Pump

Originated by Cities Service, this 24,000-pound capacity truck speeds delivery of grease to industrial plants

Cities Service on the move

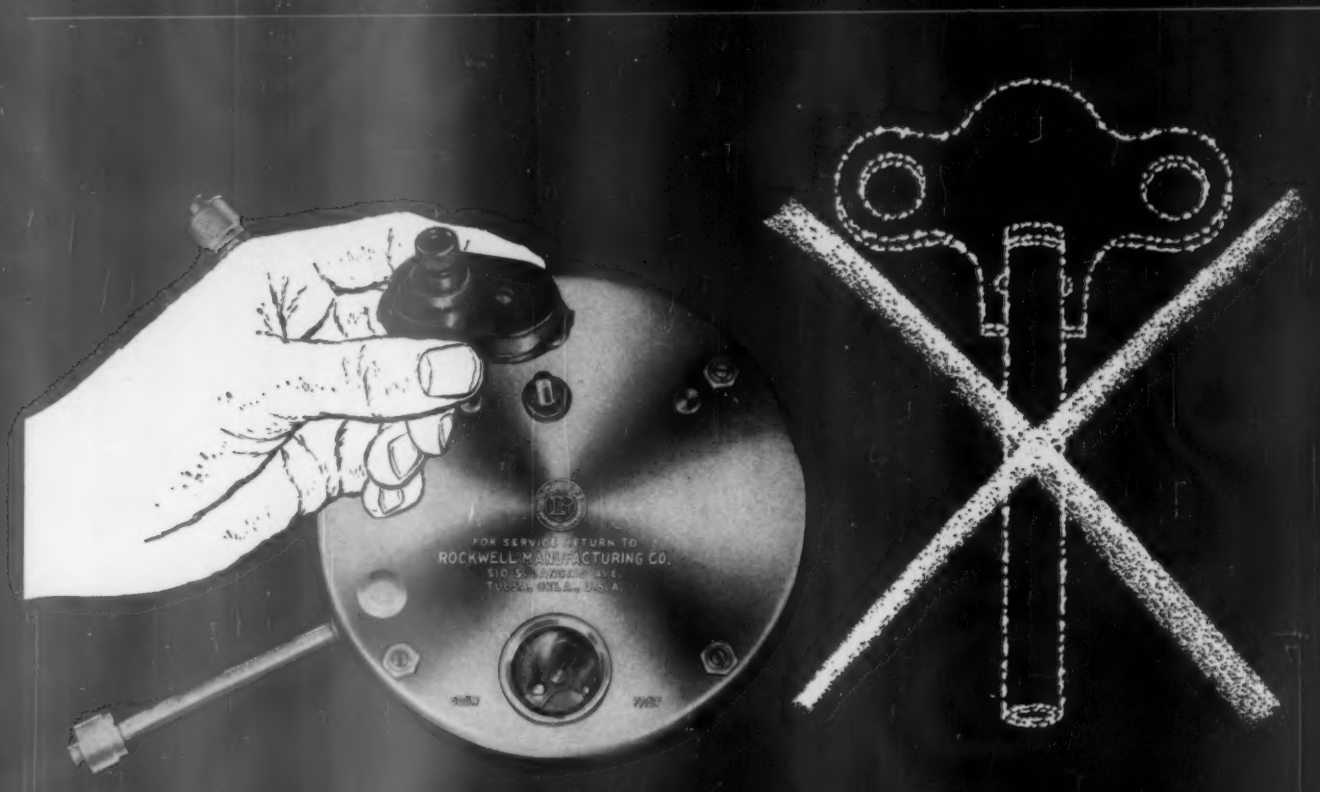
Faster . . . faster . . . faster! That must be the pace of American industry if it is to meet the challenge of the years ahead . . . but it will not be enough to do things at greater speed. They must also be done better than ever before.

Old blueprints will not serve. Cities Service has drawn new ones. They call for improved methods . . . new facilities where needed . . . intensified research . . . and the redeployment of manpower into streamlined organizational effort.

The impact of this drive for progress is being felt every day on a hundred fronts. In every area of its far-flung enterprise . . . from producing field right on through to your near-by service station . . . *Cities Service is on the move!*

"Keep your eyes on Cities Service"

CITIES SERVICE



Illustrating how speed changing turrets are applied to the chart arbor

You never need to wind the Rockwell Gas Drive

GAS (OR AIR) POWERS THIS NEW CHART TIMING DRIVE. With it you can forget the costly chore of periodic winding. It's completely self-starting, self-contained. You can use the Rockwell Gas Drive with profit and gain accurate, automatic operation of recording charts on practically any make orifice meter, gas lift intermitter, pressure recorder or temperature gauge. It is particularly applicable for remotely located instruments.

Since the Rockwell Gas Drive consumes only 6 cubic feet of gas in 24 hours it is economical to use—safe, too, for there is no exhaust problem.

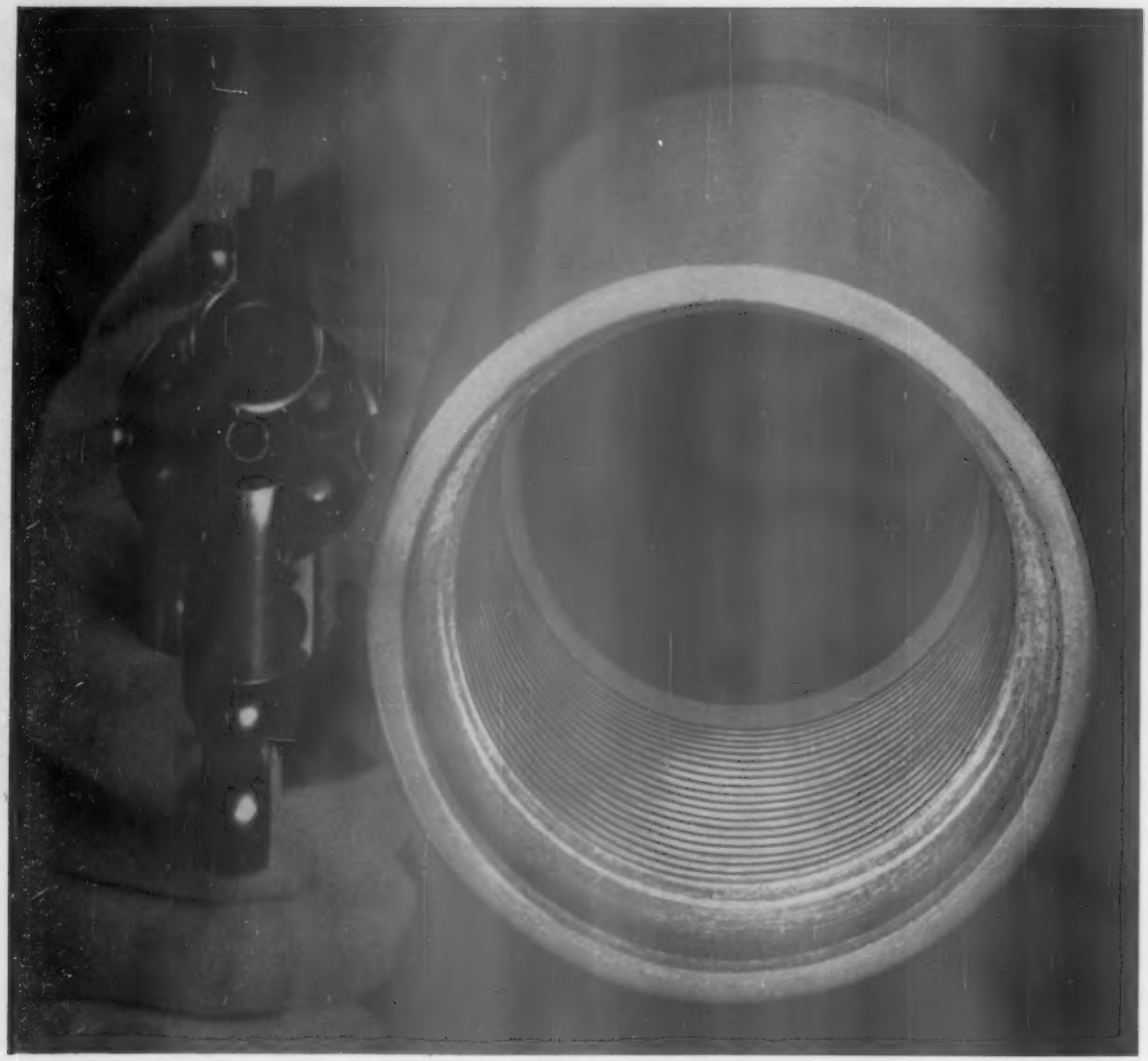
The Gas Drive operates on a pressure range of 15-25 psi and delivers 15 in. lbs. of torque to the main arbor which rotates once every 24 hours. Geared turrets which snap onto this arbor provide optional speeds of 2, 3, 4, 6, 12, 48 or 72 hour, 7 or 8 day rotation. So with a stock of Rockwell Gas Drives, plus a selection of economical turrets, you can serve all your instrument needs. Get facts now. Write Rockwell Manufacturing Company, Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Company of Canada, Ltd., Guelph, Ontario.

◀ Rockwell Gas Drive powers this typical intermitter

GAS DRIVES, CHART DRIVES

another fine product by

ROCKWELL



They've both got a "business end"

In a pistol it's the muzzle . . . and in oil country tubular products it's the threaded connections. This is a vital area that helps determine performance "life-or-death." And it's here that CF&I Seamless Casing and Tubing really has what it takes for success.

Every thread is cut by modern machinery — then checked by a contour microscope that determines absolute accuracy of angle and form. No weak links survive to render hundreds of feet of pipe worthless.

In short, CF&I Casing and Tubing holds up on the job, but never holds *you* up on the job. It's available in sizes from 2⅜" to 9⅝" O. D. and meets API specification STD 5A. Ask your CF&I salesman for complete details.

6232

The Colorado Fuel and Iron Corporation
Denver • Oakland • New York
Sales Offices in Key Cities

Trans-Canada Pipe Lines Limited Chooses Worthington SUTC's . . .

FOR FIRST FULL AUTOMATION

At central control, the dispatcher pushes a button. At the compressor station miles away, a solenoid throws an air valve. Engine and compressor cylinders begin purging . . .

At 6 seconds, ignition actuates, fuel is admitted and the engine slowly accelerates toward 160 rpm. At 20 seconds the compressor cylinders stop purging. In 5 minutes, the engine-compressor is ready to be brought on line.

This is a glimpse of normal operation of Trans-Canada Pipe Lines Limited's Maple Station—the first to be fully automated by this pipeline company. Three Worthington SUTC engine-compressors operate in pre-set sequences according to signals from the dispatcher who, though 25 miles away, could be a thousand.

These new SUTC's have a higher compression ratio for increased efficiency; improved handling of heat load through new computer-designed Turbo-Chargers; and new bearing construction. Cylinder parts and Double Deck valves were manufactured in Canada.

The station organization chart shows the benefit of these automated SUTC's. This station has no operators. This saves initial cost of four houses and salary and overhead for the operators.

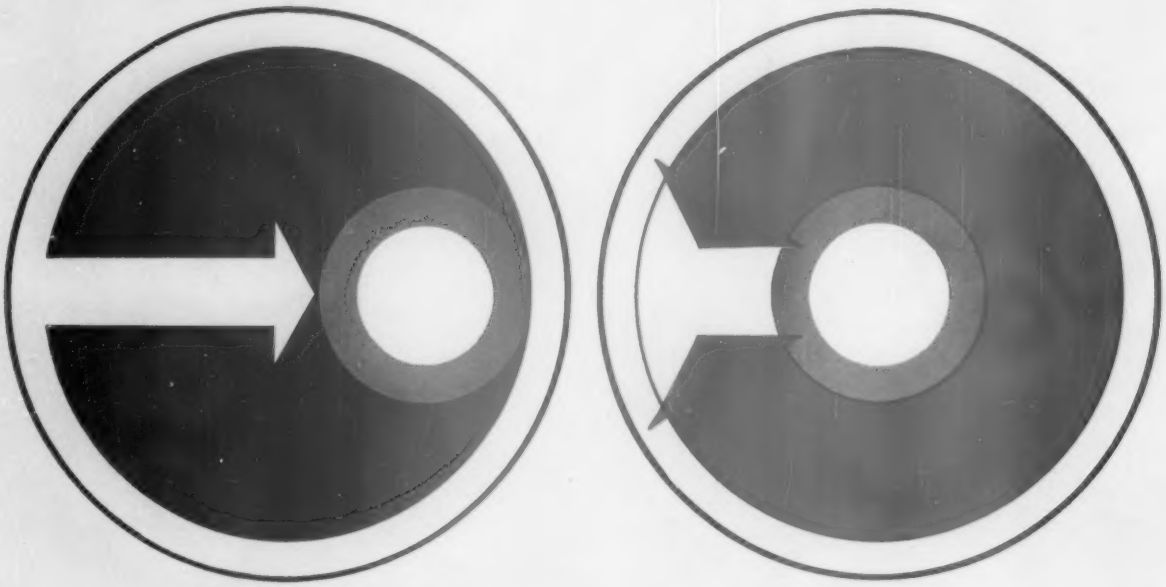
For complete information on SUTC's for automated or conventional installations, call your nearest Worthington District Office. Or write Worthington Corporation, Dept. 43-22, Buffalo, New York. In Canada, Worthington (Canada) Ltd., Brantford, Ontario.

WORTHINGTON

PRODUCTS THAT WORK FOR YOUR PROFIT

CHEMICO

NEW PIPE-LAX IS THE WORLD'S BEST STUCK PIPE INSURANCE



When pipe is stuck . . .

Pipe-Lax gets it free.

IT SOAKS PIPE FREE

Now, from Magcobar research, comes the new way, the economical way of freeing stuck pipe. With new Pipe-Lax, an organic chemical concentrate, most losses of time, money, and patience because of stuck pipe and collars can be eliminated. In extensive field applications, Pipe-Lax has been used to free stuck pipe with better than 85 percent effectiveness! It is so inexpensive, it can be used whenever you have sticking problems.

For the best insurance available against the high cost of fishing for stuck pipe, keep a drum on your well. The sooner you use Pipe-Lax for freeing stuck pipe, the better your chances are of saving an expensive fishing job. Contact Magcobar today for complete details.

Magnet Cove Barium Corporation, Houston, Texas.

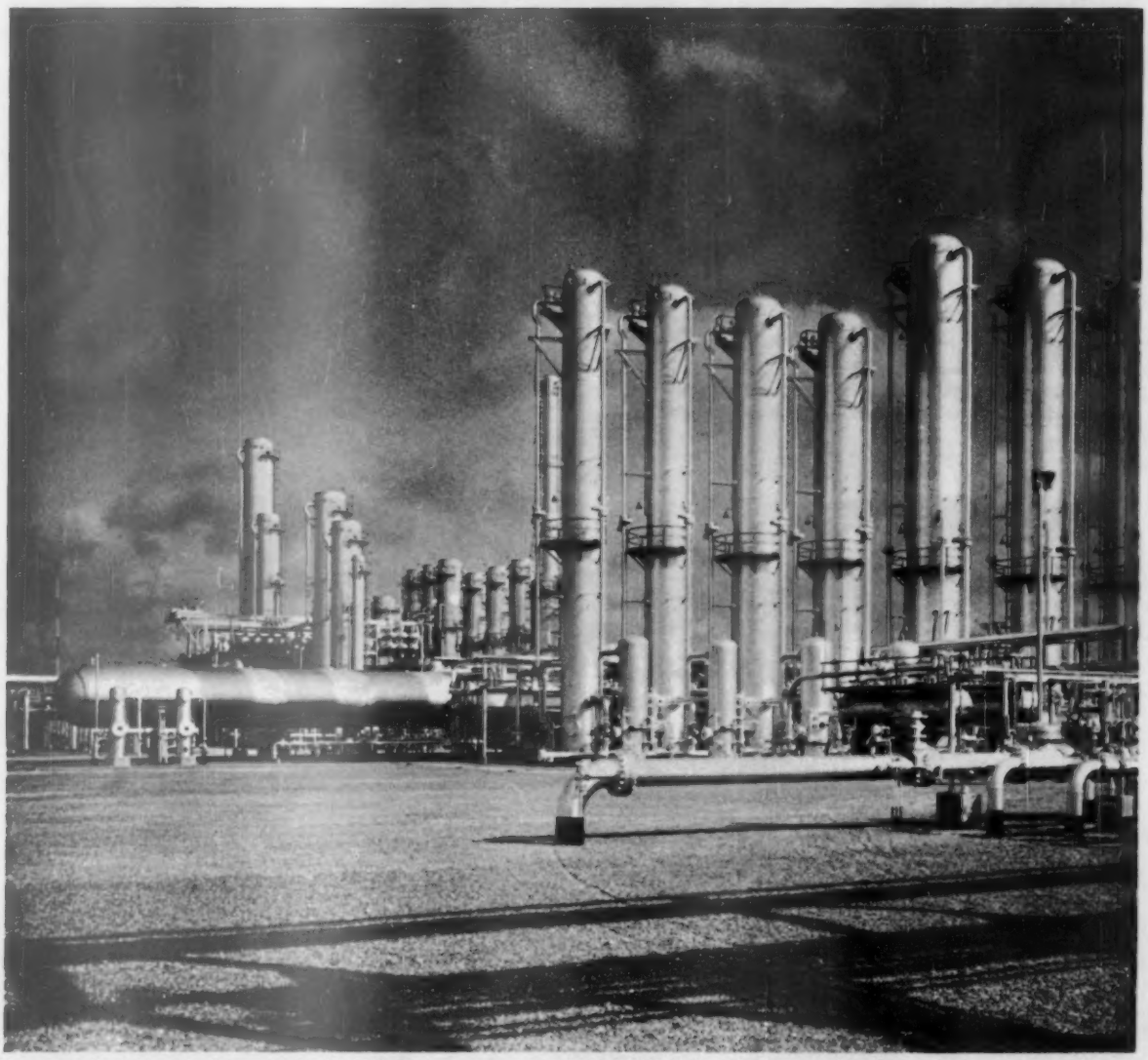
Magcobar
Complete
DRILLING MUD SERVICE

DRESSER INDUSTRIES, INC.
OIL • GAS
CHEMICAL
ELECTRONIC
INDUSTRIAL

Well Done with Magcobar Technology

Westinghouse reports on:

Nation's newest and largest Gas Cycling Plant

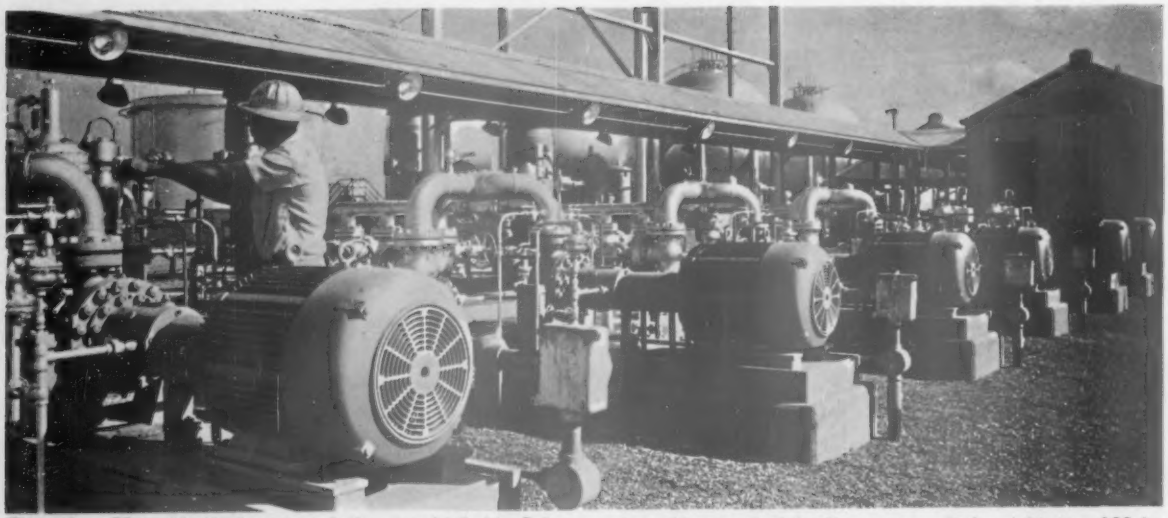


This new giant plant in the southwest which gathers, processes and distributes natural gas and its by-products, has a maximum rated capacity of 950 million cubic feet per day. All electric drives and distribution equipment at the 151 acre plant site were provided by Westinghouse. J 90178 9

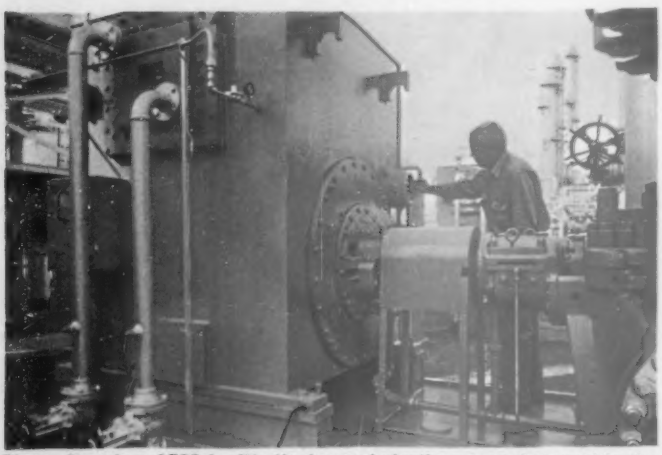
MORE (see next page)

Westinghouse reports on:

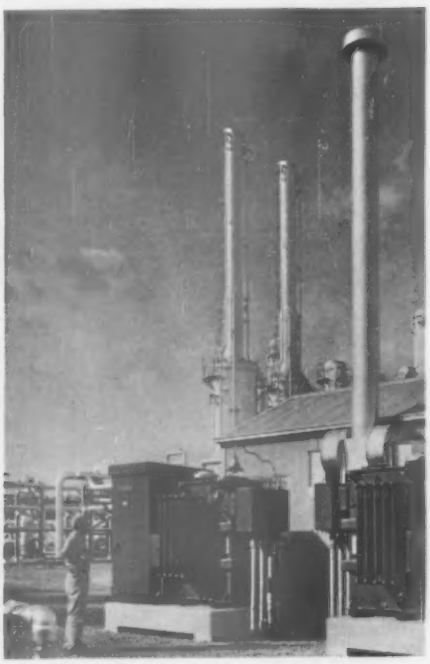
Nation's newest and largest Gas Cycling Plant



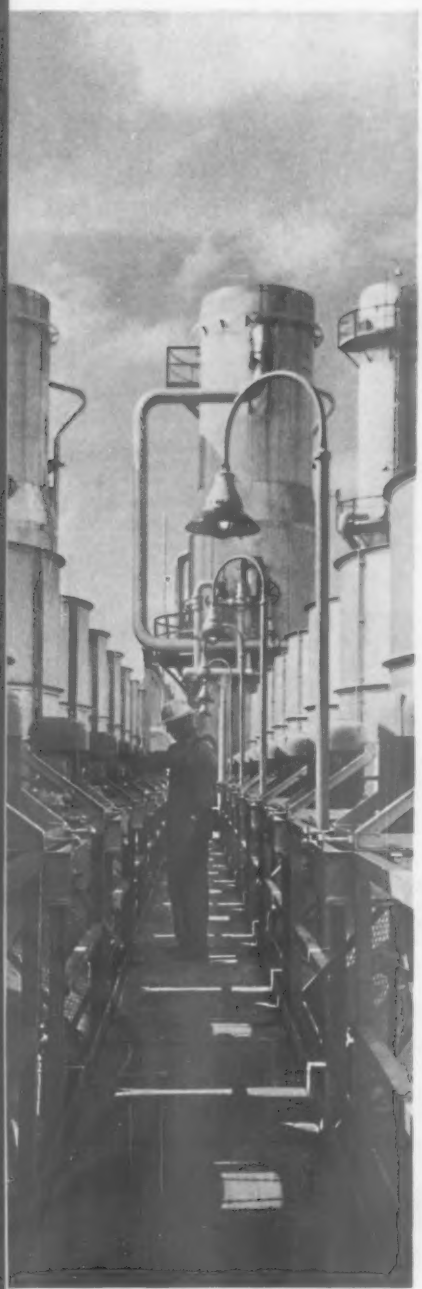
These four 75 hp Westinghouse explosion proof Life-Line® A a-c motors drive product loading pumps. At far right, two 100 hp Westinghouse a-c motors power gasoline shipping pumps.

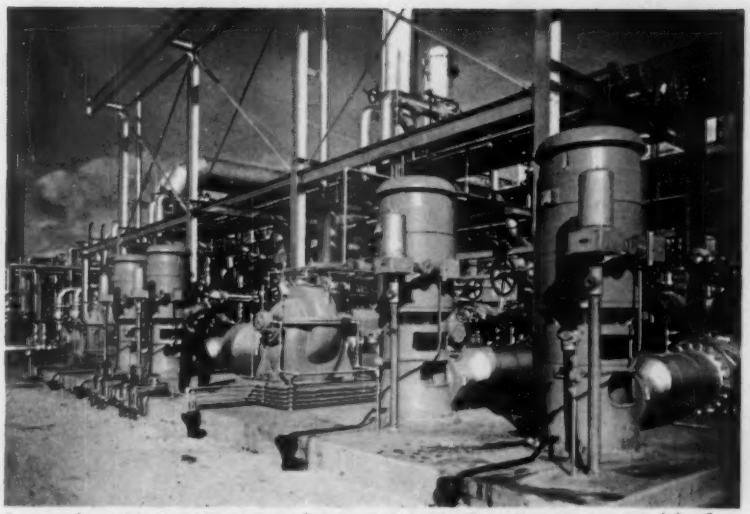


Shown here is a 1500 hp Westinghouse induction generator used in the plant's main processing area. The generator is in fact a 1500 hp 1800 rpm squirrel cage motor driven above synchronous speed by an oil line pump. Pump runs in reverse to drive motor as generator.

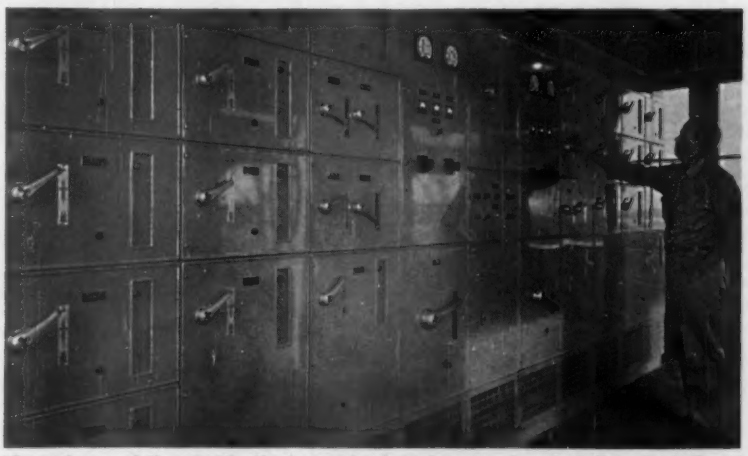


Pictured (right) is one of the six Westinghouse Load centers serving this large gas recycling plant. Two 1000 kva Westinghouse transformers (in foreground) supply power to injection pumps, de-ethanizer feed pumps, cooling fans and process pumps in the main processing area. J-96176-2





Pumps furnishing cooling water for product and oil coolers are powered by four vertical 200 hp explosion proof Westinghouse Life-Line® A a-c motors.



View of one of the six Westinghouse load centers employed at the plant. Panelboard includes individual controls for pumps, fans and air compressors as well as the lighting system in the compressor area.

Twenty-two large low pressure "still" condenser fans serving the main processing plant area are individually driven by 10 hp Westinghouse Life-Line® A a-c motors.

J-96176-3

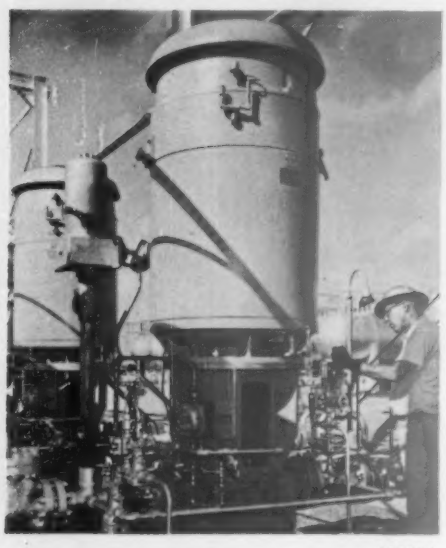
MORE (see next page)

Westinghouse reports on:

Nation's newest and largest Gas Cycling Plant

High voltage Westinghouse switchgear controls power distribution from four steam-driven turbo-generators to the six load centers at this new giant 151 acre plant in the southwest which has a maximum rated capacity of 950 million cubic feet per day.

Two of three 200 hp Westinghouse explosion proof, fan-cooled motors drive vertical pumps to pump butane via pipeline to customers in the Southwest. Two similar 300 hp motors in this same area deliver propane also by pipeline.



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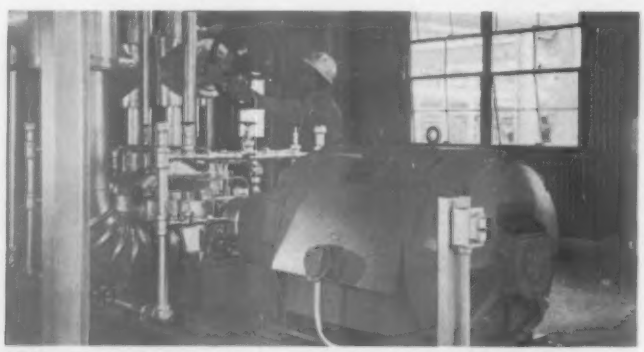
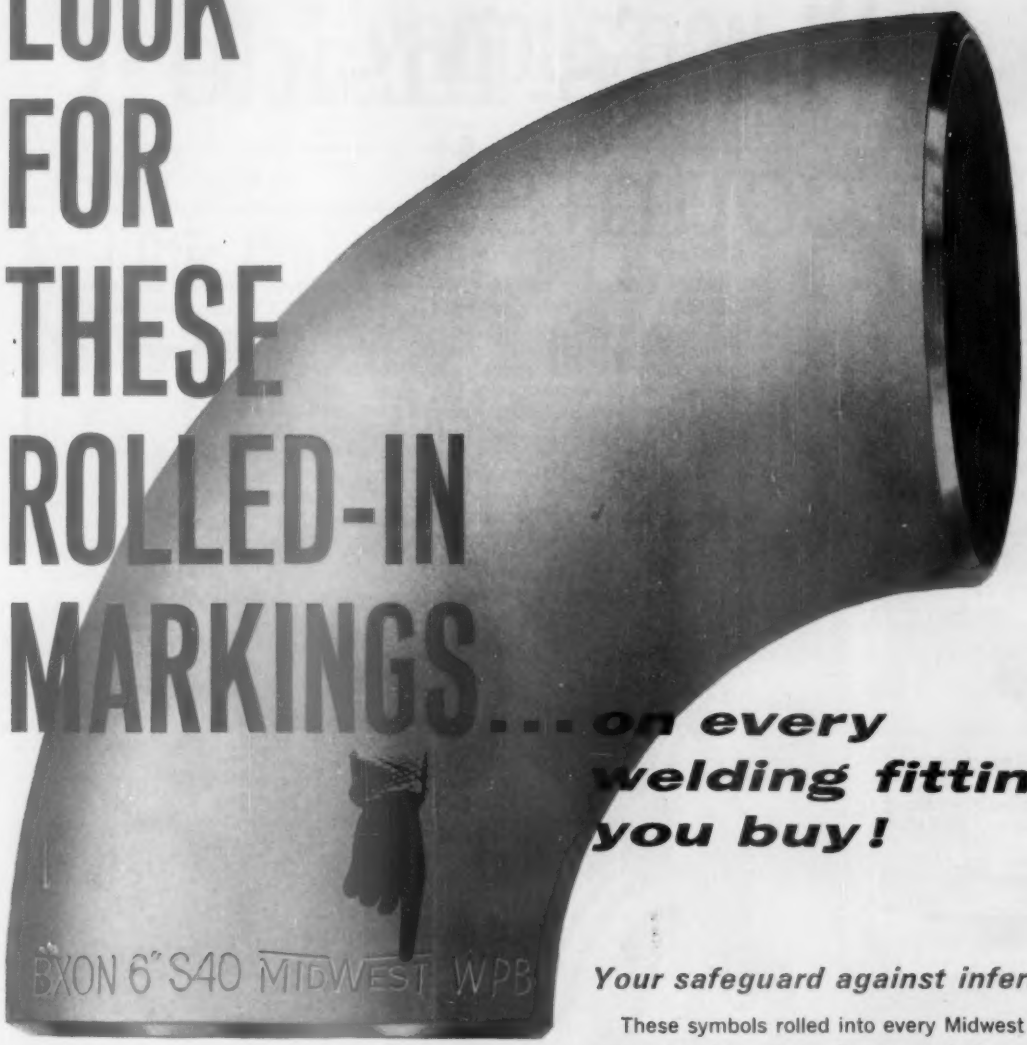


250 hp Westinghouse a-c motor which powers a boiler feed water pump.

Westinghouse: Single source for total electrical services to the industry. For information on how Westinghouse engineering services and products can help you realize major improvement in process cost and efficiencies, see your local Westinghouse sales engineer or write: Westinghouse Electric Corporation, Box 868, Pittsburgh 22, Pa. You can be sure . . . if it's Westinghouse.

Westinghouse

LOOK FOR THESE ROLLED-IN MARKINGS... on every welding fitting you buy!



BXON—**HEAT SYMBOL**—Used to identify physical properties, chemical analysis of raw material, radiographic control testing, and heat treatment.

6" S40—**SIZE AND WALL THICKNESS**

MIDWEST—**TRADE MARK**—Your Midwest distributor's guarantee of brand-new fittings made from prime domestic steel.

WPB **GRADE OF STEEL**—Your identification of the grade of steel... and your assurance that each Midwest fitting is made in full compliance with ASTM and ASA standards.

Your safeguard against inferior quality

These symbols rolled into every Midwest fitting are your guarantee of brand-new fittings made from prime domestic steel in full compliance with ASTM and ASA standards!

Even the markings are made with specially designed low-stress dies to preclude injury to the steel. Care such as this demonstrates Midwest's sincere determination to manufacture fittings of highest quality throughout... unmatched anywhere!

Write for Bulletin 60C, ONLY MIDWEST MAKES BOTH, the story of how superior quality fittings are made from either seamless tubing or rolled plate.

MIDWEST PIPING

A Division of Crane Co. / 1450 South Second St., St. Louis 4, Mo.

6124

When selecting roller bearing pillow blocks, remember

it's what's inside that counts!

MAXIMUM SIZE AND NUMBER OF ROLLERS for highest capacity

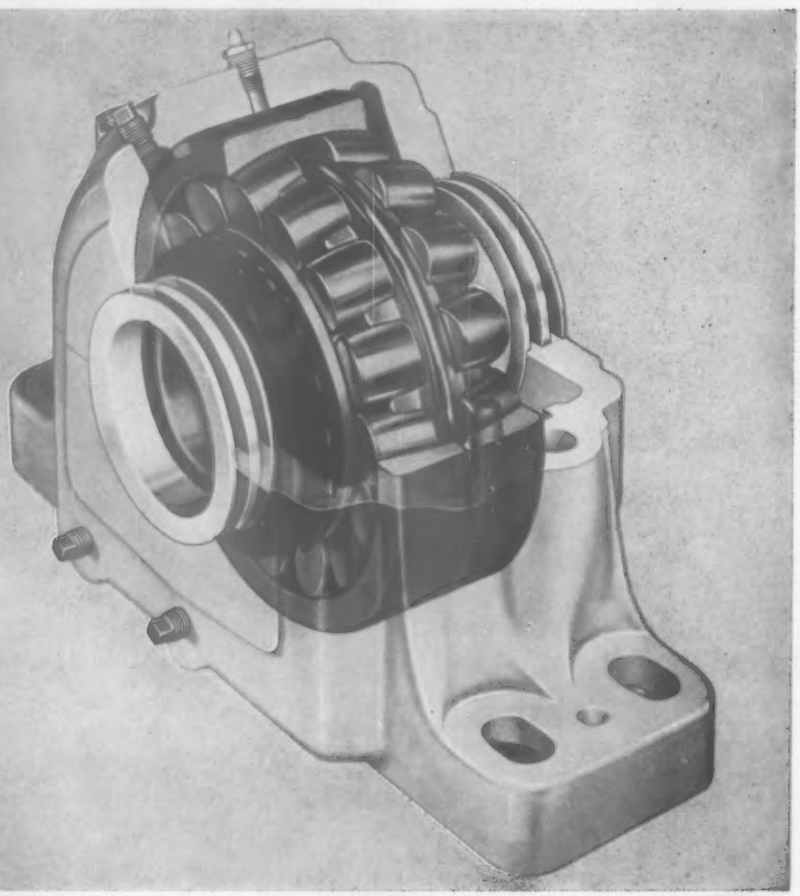
CENTRIFUGALLY CAST, PRECISION MACHINED BRONZE RETAINERS for smooth, quiet operation

HIGH, HEAVY INNER RING FLANGES for ease of installation and removal

AND INSIDE LINK-BELT ROLLER BEARING BLOCKS you'll find Link-Belt's new spherical roller bearings . . . with big, mirror-smooth, highest capacity rollers; centrifugally cast, precision machined bronze retainers; heavy, broad-shouldered inner rings. *All* the best features of modern bearing design compactly unitized for utmost economy and long service life.

Link-Belt spherical roller bearing pillow blocks are self-aligning. Available in adapter mounting and direct-shaft mounting types for shafts from 1 7/16" to 12". Choice of two effective seals: all-purpose steel, multi-labyrinth seals, or Dacron-contact seals.

For full details, call your nearest Link-Belt office or authorized stock-carrying distributor. Look under BEARINGS in the yellow pages of your telephone directory. Ask for Book 2760.



SERIES 6800, 6900, 7800, 7900 have exceptionally rugged, two piece housings—machined as two perfectly matched parts providing easy installation.

LINK-BELT

SELF-ALIGNING BALL AND ROLLER BEARINGS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 26, Odessa, Tex., New Orleans 16, Shreveport, La., Los Angeles 22 (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in all Fields. 15,414-B

SPECIAL REPORT TO MANAGEMENT

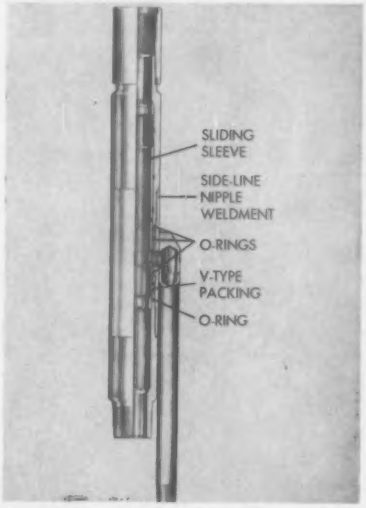
OTIS PRODUCTION NEWS

Volume II, Number 2 **Otis Engineering Corporation • Dallas** *Production Equipment and Services*

New Otis Cross-Over Tool Solves Zone Feeding Problem In Single String Dual Completions

Sliding Side-Door® With Special Weldment Provides Complete Zone Isolation With Cross-Over Chokes Out of Well

CORPUS CHRISTI — Another downhole completion and production problem has been solved by Otis Engineering Corporation with the development of a new type of cross-over tool. The new tool is essentially a Type A Otis Sliding Side-Door to which has been added a special one-inch pipe weldment on one side of the outer mandrel, in place of the usual slotted ports. The tool is designed to be made up in the tubing with a short tubing sub and Type S Otis Landing Nipple above it and a tubing sub and Ported Landing Nipple below it, and then set in a dual or by-pass type packer. When installed with a Type SS Otis Plug Choke set in the ported nipple, the sleeve may be opened to permit production from the upper zone to be brought into the tubing through the one-inch pipe weldment while flow from the lower zone is directed into the annulus.



See schematic well diagram — right

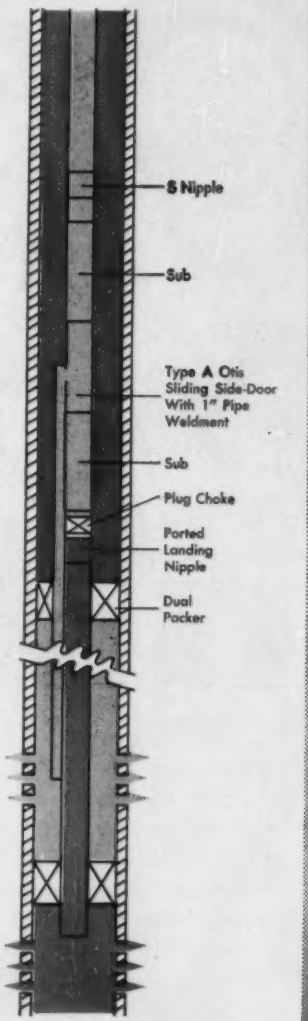
If desired, a straight flow choke may be landed in the assembly to permit production of the lower zone through the tubing while flow from the upper zone is produced through the annulus.

This new Otis Sliding Side-Door Cross-Over was developed at the request of a progressive Texas-based producing company which had experienced extended periods of lost production from the low pressure zones in its single string dual completions after changing a cross-over choke in conventional cross-over equipment, or when a choke had been out of the well for a short period of time for various types of wire line work. This loss of production proved to be the result of the high-pressure zone feeding the low-pressure zone.

According to the company, the new Otis Sliding Side-Door Cross-Over not only proved effective in solving its zone feeding problems, but it has also eliminated the need of having a pump truck on location to equalize pressure across the two zones — as was frequently necessary before the choke could be removed from conventional cross-over equipment. The company also reports it has successfully fractured the upper zone of a number of its wells through the one-inch pipe without damaging the tool.

The Type A Otis Sliding Side-Door, from which this new type of cross-over was derived, is a circulating and production tool which is used downhole to provide selective communication between the tubing and the annulus. The tool has a ported sleeve which is designed to be moved up or down within a ported mandrel. The sleeve may be shifted by one of two ways: 1) by standard wire line methods, or 2) by pumping down an expendable shifting tool. V-type packing and O-rings are used to provide a positive seal between the sleeve and the mandrel when the sleeve is closed.

The new Otis Sliding Side-Door Cross-Over is another example of the ingenuity of Otis' well completion specialists in the field and its engineering department in Dallas. Literally thousands of production problems of this nature have been solved by Otis over the past 32 years. For more information on the new Otis Sliding Side-Door Cross-Over, or for help with any specific production or completion problem, call the Otis office nearest you or write Otis, Dept. 2-W, Box 35206, Dallas 35, Texas. You will find your Otis specialist ready to help you — anxious to serve you.



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OTIS

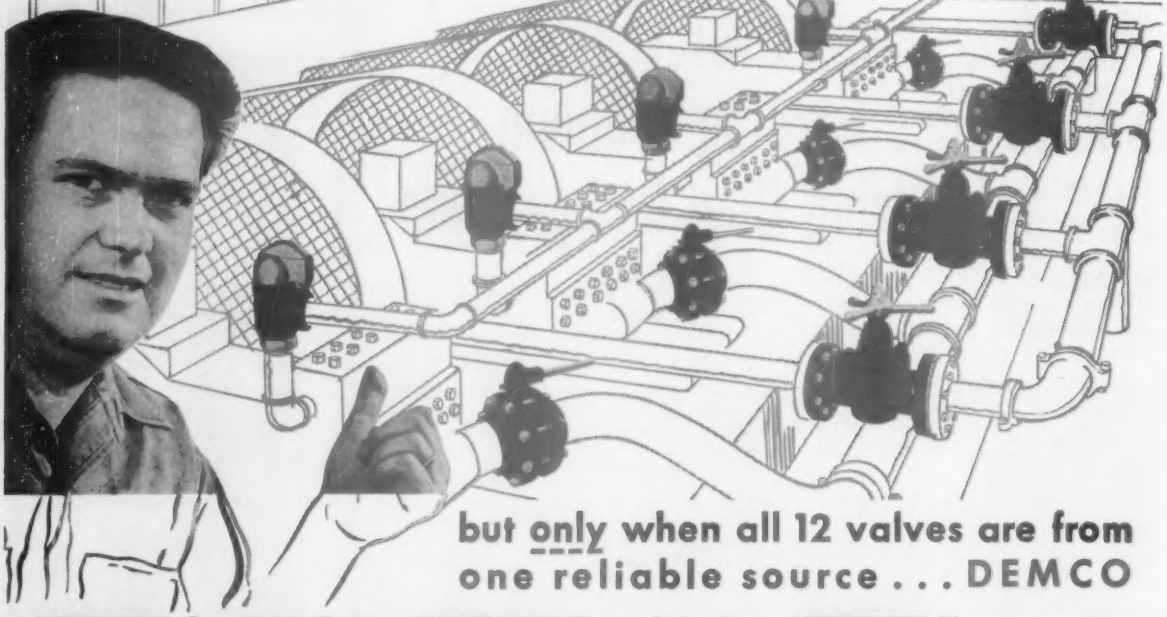
Engineering Corporation

General Offices:

6612 Denton Drive • Dallas, Texas

equation for efficient operation:

3×4=1



but only when all 12 valves are from one reliable source . . . DEMCO

Dependable Demco Safety Relief Valves provide maximum protection against excessive pump and line pressures and offer the ultimate in safety to workers. Built-in safety cap encloses shear bar and nail, yet opens instantly when line pressure shears the nail. Advanced Demco design insures immediate relief from excess pressure by use of a *single* nail for *all* relief settings on the shear bar. Available in standard cast steel valve and sub-assembly or non-corrosive bronze valve with stainless steel sub-assembly.

The exclusive features of Demco Butterfly Valves offer bubble-tight seals in pressure or vacuum applications for liquids, vapors, or solids. The Demco disc "floats" on the stem, without set screws or exterior fastenings, and finds its true center for a positive, non-directional shut-off. A one-piece Buna-N seat, bonded to steel, provides a stronger, larger contact area for disc, acts as stem packing and eliminates needs for gaskets or "O" rings between flanges. Only the Buna-N synthetic seat and corrosion-resistant metal disc are exposed to line flow. Factory tested in excess of working pressure, Demco Butterfly Valves offer quick in-line repair.

You can count on longer, trouble-free valve life—and, a *drop-tight* seal every time—with the rugged, corrosion-resistant Demco Gate Valve. Exclusive spread-ring seat construction gives you a *positive* rubber-to-metal seal without undue stem torque—durable, synthetic Buna-N against corrosion-resistant stainless, Monel, aluminum bronze or steel. Entire inner assembly lifts out for faster, easier *in-line* inspection. With Demco's unique design, fewer parts are subject to wear. Stem threads are self-lubricated and protected from corrosion by a *double* stem seal.

Wherever durability, reliability and safety are essential, on drilling and production installations all over the world, rugged Demco Valves have proved to be the answer. Choose all three or just one—but choose Demco!

All valves available in popular sizes and pressures at supply stores everywhere. Write Demco today for complete engineering details!

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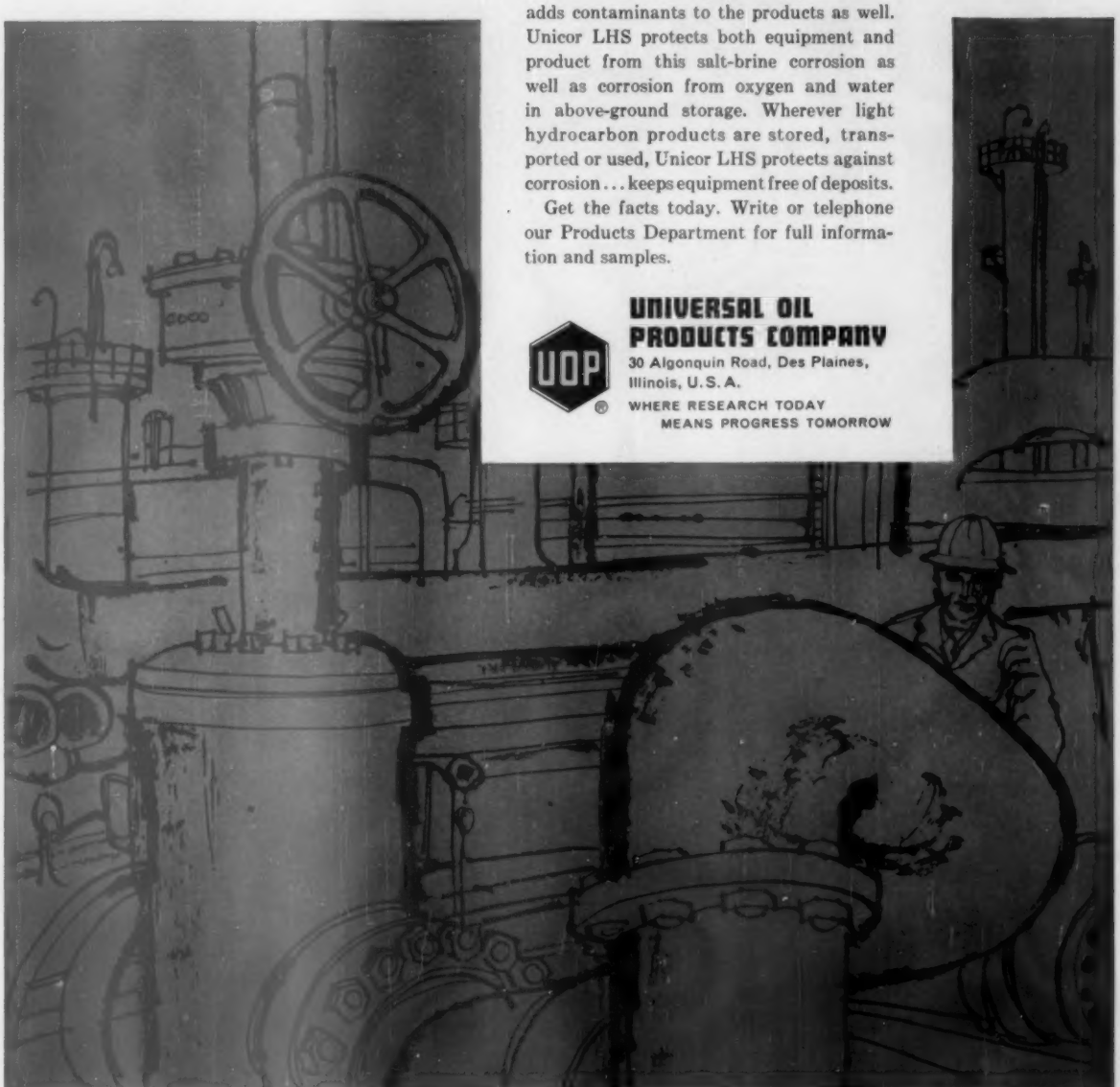

UNICOR LHS

The reputation of a valve is made by the plants it keeps on stream

A valve is often looked upon as a "supply item" until it prevents a major process shutdown and profit loss...

Hancock Steel Valves provide the dependable protection demanded for every process application today and tomorrow. They are available in a wide range of operational pressures and temperatures . . . in an extensive selection of alternate trim, body, and bonnet materials to match the toughest services. They have that extra measure of quality that only a leader knows how to build into a valve... extra quality that extends the operating period between turnarounds and assures efficient, economical processing of petroleum and chemical products.

The valve illustrated at the left is the Hancock Type 950 Steel Gate Valve widely used by the processing and power industries.

For technical assistance in selecting quality Hancock Steel Valves, phone your industrial supply distributor or write for Catalog 200A.

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HANCOCK Steel Valves

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MANNING, MAXWELL & MOORE, INC.

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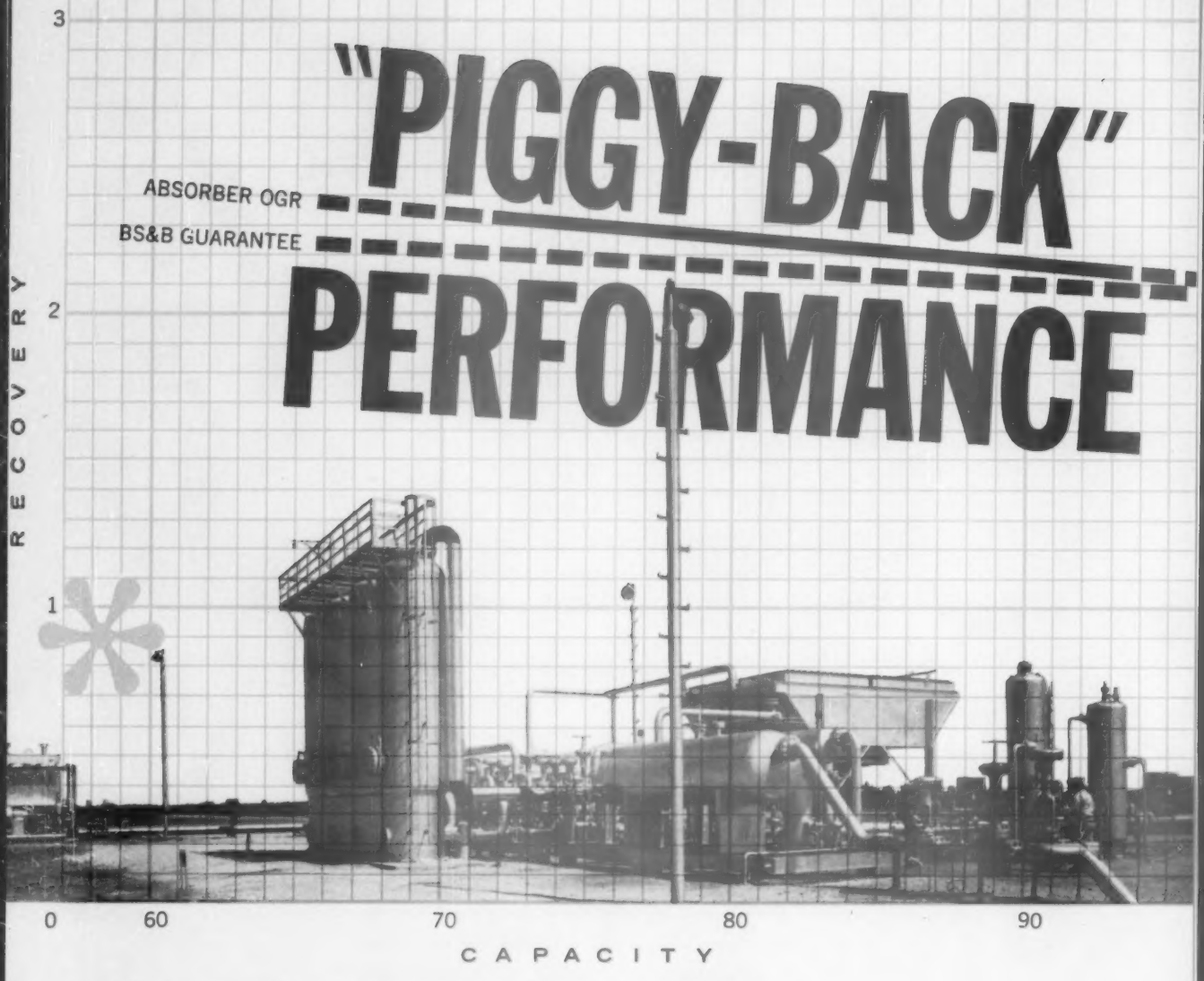
Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario
Latin America: Export Division, Chrysler Building, New York, N. Y.
Europe: Manning, Maxwell & Moore, S.A., Fribourg, Switzerland

"PIGGY-BACK" PERFORMANCE



Look at the liquid recovery curves for this BS&B DRY FRAC Unit. Actual recovery rate slightly exceeds and parallels the guarantee so closely we will call it "piggy-back" performance. This takes real process know-how.

Lean streams, rich streams, sour or sweet... BS&B has the equipment to handle them all. Glycol or dry desiccant dehydration. Desulfurization or CO_2 removal. Low temperature separation with natural, mechanical, or ammonia absorption refrigeration. Or cold feed stabilization.

The economics of YOUR situation will dictate selection of the proper equipment for the highest rate of return and quickest pay-out.

Want to discuss your gas processing requirements in preparation for the big gas demand ahead? Call your nearest BS&B sales office, or write to Black, Sivalls & Bryson, Inc., Box 1714, Oklahoma City, Okla.

* The new BS&B "Uniflux" Heat Exchanger is an important component of this DRY FRAC Quick Cycle Hydrocarbon recovery unit. Instrumentated with completely automatic controls to assure safe, efficient operation, "Uniflux" heats with high temperature inert gas with no flame impingement on tubes. Fast response to heat and cooling loads make it ideal for intermittent service.

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BS&B

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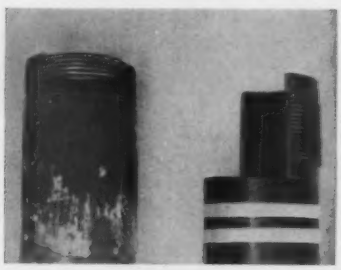
Fibercast flow line suspended by cable 900 feet from well to tank battery. Typical application of Fibercast because of its light weight, superior beam strength and resistance to elements.

Fibercast® performs better in oil country than any other non-metallic pipe

The reinforced epoxy resin construction of Fibercast Tubing and Line Pipe enables it to indefinitely withstand high pressures, high temperatures, and extreme corrosive conditions.

Fibercast is *proven* pipe, too. Few industries make more stringent demands upon pipe and tubing than the oil industry. Yet Fibercast's record proves that it more than adequately meets these demands in installation after installation. It has an operating temperature range wider than any other non-metallic pipe (-65° to 300° F.) Its operating pressure range extends to 1200 psi. But best of all, serious corrosion problems are almost completely eliminated with Fibercast.

Because it is not subject to cold flow or permanent set, Fibercast is remarkably easy to install. It readily follows ditch contours, saving costly manhours where other non-metallic or coated metal pipes simply are not suitable. Moreover, Fibercast's operating collapse strength, an important factor in installation design, is capable (based on long-term testing) of sustaining a collapse load of *twice* the rated collapse.



Fibercast Tubing (right) used to suspend a 1,200 lb. pump for 3 years in a salt water supply well. *There was no loss in strength.* The damaged plastic-coated steel nipple (left), was used in the same installation, failed after 3 months' service.

Its linear coefficient of thermal expansion (7.06 X 10^{-6} to 8.25 X 10^{-6}. in./in./ °F.) is essentially the same as that of steel. But Fibercast is much lighter than steel, (less than ¼ its weight), and is correspondingly easier to work with. Yet, because of its strength, Fibercast can even be installed on pipe racks with span lengths normally used for metal pipe.

Fibercast has been tested in 338 common corrosive solutions and competently handled 320! Actual installations in the oil fields have revealed Fibercast's effectiveness against corrosion, contamination, abrasion, scaling and paraffining. Used as a flow line . . . in a salt water disposal well . . . or as shot hole casing, Fibercast performs better, lasts longer, costs less.

Fibercast Fittings are a "must" in oil country, too. Besides the ready availability of the world's most complete stock of standard sizes and types, you can have couplings designed and made to order for individual requirements.

If *you* would like to learn more about controlling corrosion through the use of Fibercast, mail the coupon below.

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Box 727, Sand Springs, Okla.

Please send me further information about Fibercast Tube and Pipe.

OGJ-91

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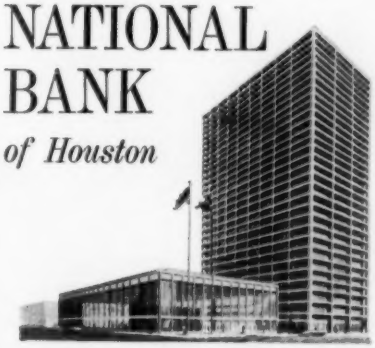

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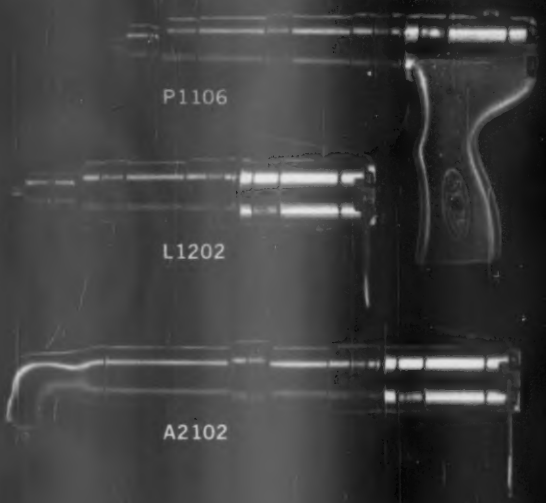

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Whether it's an electric drill, screwdriver, air impact screwdriver or one of the new P, A, L series, expect stamina, power, smooth performance, and ease of operation from the SIOUX family of fine tools. Ask for a demonstration!

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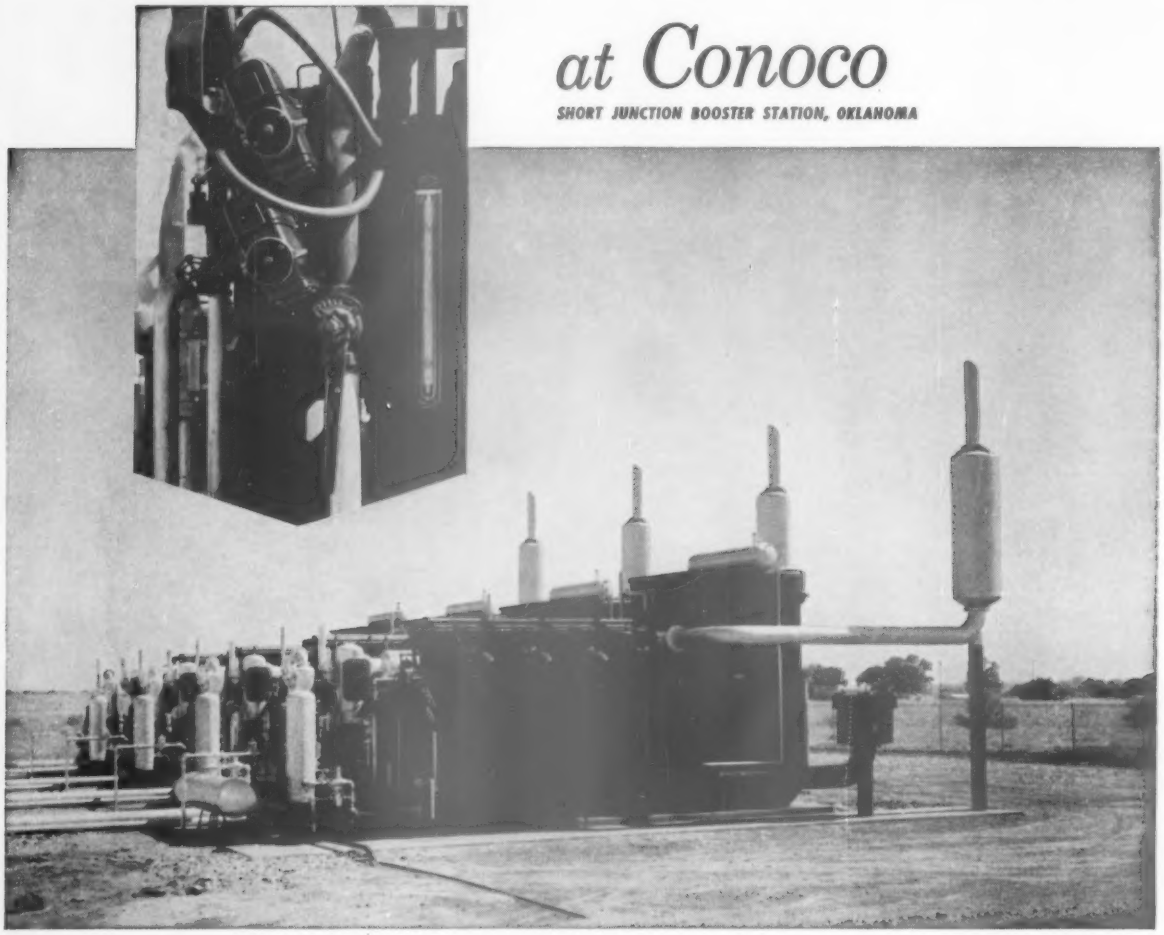

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SHORT JUNCTION BOOSTER STATION, OKLAHOMA

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For many years Bendix ignition equipment has given dependable service in a wide variety of petroleum and natural gas applications. The Cooper-Bessemer gas engines, equipped with Bendix* LAR magnetos shown here, provide efficient, economical gas combustion to help move natural gas through the pipeline system at the Short Junction Booster station of Continental Oil Company in Oklahoma.

Bendix LAR magnetos provide reliable ignition at the lowest operating cost. Reserve power insures smooth running engines, even under the most adverse operating conditions. The Bendix LAR magneto and its companion Hi-V transformer coil are a matched ignition system that meets the most rugged engine requirements.

LA magnetos now in service can be easily converted to the modern Bendix LAR type with conversion kits now available. They can be obtained from your Bendix ignition distributor or from our factory. For complete details, write SCINTILLA DIVISION OF THE BENDIX CORPORATION, Sidney, New York.

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Scintilla Division
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ORBIT FORGED STEEL PRODUCTION VALVES

WITH COMBINATION SEATING of TEFLON* and METAL to METAL

PLUS: *THESE ADDITIONAL FEATURES*

- Low Opening and Closing Torque for Easy Operation
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FOR CHRISTMAS TREES AND GENERAL PRODUCTION SERVICE

* **TEFLON** is duPont's registered trademark for its family of fluorocarbon resins, including TFE resins and FEP resins.

WRITE FOR BULLETIN No. 400

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They Say—

Lost in Red Square

Dear Sir:

I found Mr. Connole's third installment in the August 21 issue on the Russian gas fields most interesting and informative ("Where Russian Gas Is Headed," p. 62).

Just one question—how many other readers picked you up on the caption error on Page 50 ("Journally Speaking") identifying the Lenin Museum as St. Basil's Cathedral? I believe you have Red Square turned around.

Erwin von Allmen
Arthur D. Little, Inc.
Cambridge, Mass.

So far two readers have noticed this error. Our caption writer is writing 50 times "St. Basil's has onion towers."—Ed.

Reliable results

Dear Sir:

I read with interest and concern your commentary on the adequacy of AGA's annual projection of customers, sales, revenues, miles of main and construction expenditures on Page 115 of your July 31 issue ("AGA to Study Long-Range Supply and Demand").

The article implied that since projections were not based on individual reports from operating companies they were inadequate and subject to possible error.

Prior to 1957, AGA undertook annually to survey the industry for 5-year forecasts on customers, requirements, and supplies. The AGA Bureau of Statistics undertook on an independent basis to forecast customers and demand and compared the results with those based on individual company reports. The results were very, very close.

Because of this, the former Committee on Economics agreed to discontinue the 5-year forecasts of gas requirements and supplies and to use projections based on internal sources.

The continuation by the Bureau of Statistics in providing industry projections does not impinge upon the work of the Committee of Gas

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Requirements and Supplies, headed by Larry Shomaker. This latter group has a far more serious and important job . . . the preparation of long-term supply estimates. The Bureau of Statistics has never attempted to evaluate this aspect in its projections.

Main purpose of our industry 10-year projections . . . is to provide useful indications of the probable potential magnitude of gas industry operations during the next decade. They are reviewed annually, in the light of the most recent information, and modified accordingly.

Theodore I. Gradin, Director
Bureau of Statistics
American Gas Association

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

SEPTEMBER

11-15 Instrument Society of America, fall instrument-automation conference and exhibit and sixteenth annual meeting, Biltmore Hotel and Memorial Sports Arena, Los Angeles.

12-13 American Gas Association, Southern Gas Association, annual accident prevention conference Statler Hilton Hotel, Dallas.

13-15 Pacific Coast Gas Association, convention and annual meeting, Coronado Hotel, Coronado, Calif.

13-15 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

13-15 National Petroleum Refiners Association, fall meeting, Traymore Hotel, Atlantic City, N. J.

13-15 National Northern Development Conference, "Canada's New Role in Resource Development," MacDonald Hotel, Edmonton.

14 Natural Gas Processors Association, Rocky Mountain regional meeting, Northern Hotel, Billings, Mont.

15-16 Kansas Geological Society, annual field conference, Mark Twain Hotel, Hannibal, Mo.

17-20 American Institute of Electrical Engineers, annual electrical conference of the petroleum industry, Jung Hotel, New Orleans.

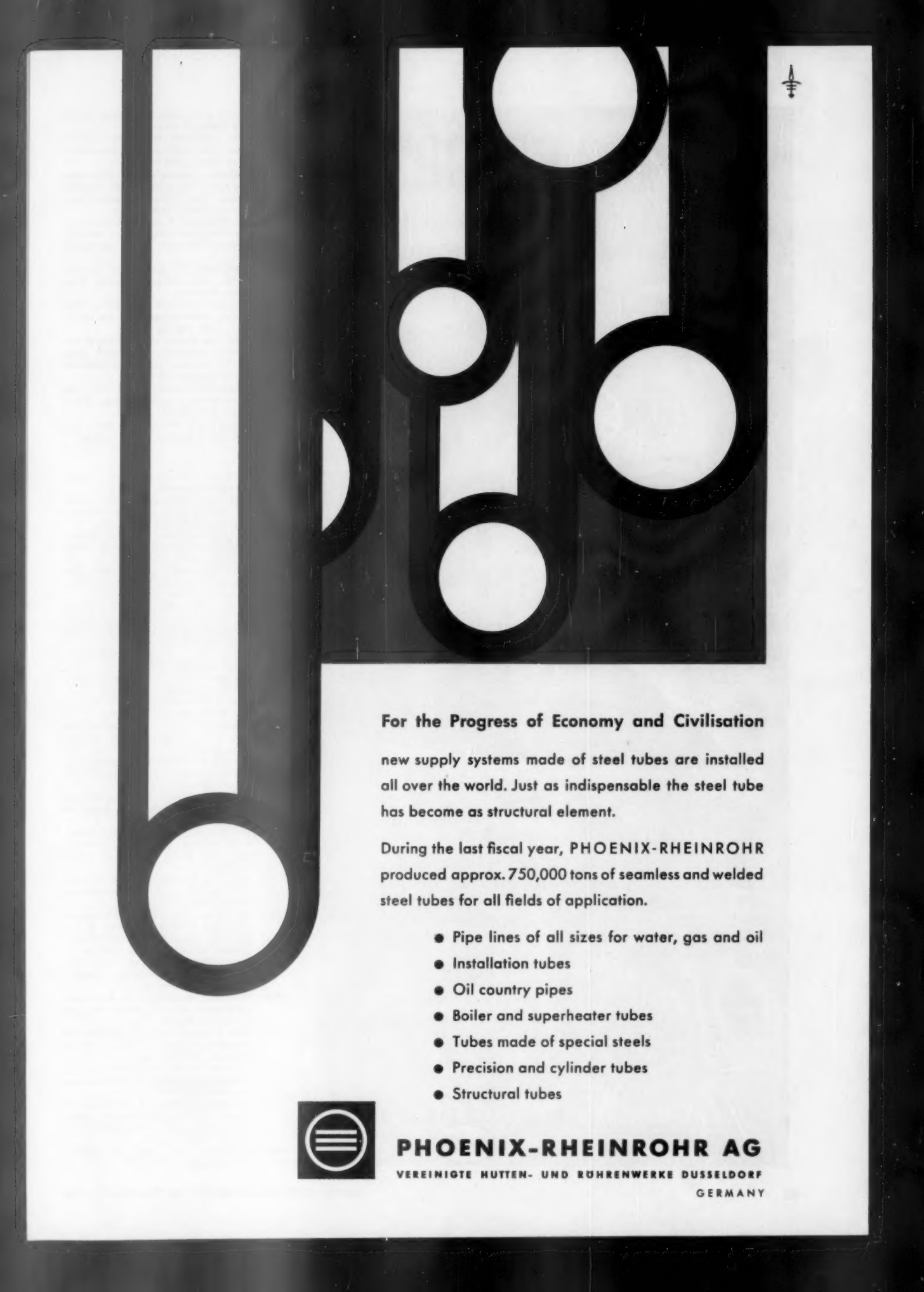
18-19 Independent Natural Gas Association of America, annual meeting, Shamrock Hilton Hotel, Houston.

18-20 Standards Engineers Society, tenth annual meeting Hotel Sherman, Chicago.

20 API, Coalinga-Kettleman chapter, annual barbecue and golf tournament, Polvadero Country Club, Coalinga, Calif.

20-21 National Petroleum Refiners Association, Rocky Mountain regional meeting, Henning Hotel, Casper, Wyo.

20-21 American Institute of Electrical Engineers, Institute of Radio Engineers, Instrument Society of America, in-



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new supply systems made of steel tubes are installed all over the world. Just as indispensable the steel tube has become as structural element.

During the last fiscal year, PHOENIX-RHEINROHR produced approx. 750,000 tons of seamless and welded steel tubes for all fields of application.

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- Oil country pipes
- Boiler and superheater tubes
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- Precision and cylinder tubes
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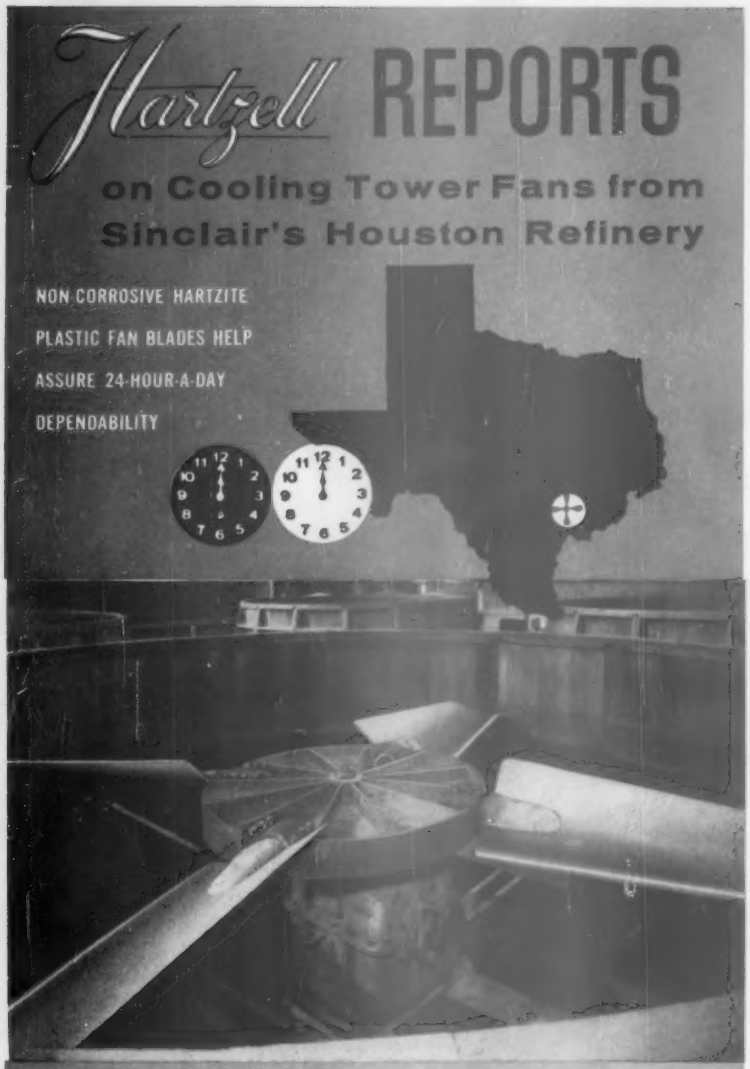

At Sinclair's Houston Refinery, six 16-foot cooling tower fan blades made of non-corrosive Hartzite plastic have been delivering 24-hour-a-day dependability for over five years.

Exclusive Hartzite plastic has been proved on thousands of installations in chemical plants, refineries and power plants to be the material most resistant to corrosion and mechanical damage. It absorbs vibration and its strength is far greater than required to withstand normal stresses. In addition, adjustable-pitch, tapered blades are heavily reinforced.

Hartzell designs and manufactures cooling tower and heat exchanger fans to cover every application. It will pay you to get all the facts from your nearby Hartzell representative, or, write direct for your copy of Bulletin A-111C.

Hartzell PROPELLER FAN COMPANY
PIQUA, OHIO
Engineering offices in principal cities
Div. of Castle Hills Corp.
HARTZELL

dustrial electronics symposium, Bradford Hotel, Boston.

20-21 Ohio Petroleum Marketers Association, fall conference, Commodore Perry Hotel, Toledo.

20-22 National Association of Corrosion Engineers, Permian Basin section, annual West Texas corrosion tour, Lincoln Hotel, Odessa, Tex.

21-22 Air Pollution Control Association, east-central section, annual meeting, Sheraton-Seelbach Hotel, Louisville, Ky.

22-23 Association of Desk and Derrick Clubs, tenth annual meeting, Rice Hotel, Houston.

24-27 American Institute of Chemical Engineers, national meeting, Lake Placid Club, Lake Placid, N. Y.

24-27 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Muehlebach Hotel, Kansas City.

25-27 Texas Mid-Continent Oil and Gas Association, annual meeting, Texas Hotel, Fort Worth.

25-28 American Welding Society, fall meeting, Adolphus Hotel, Dallas.

OCTOBER

1-4 American Gas Association, annual convention, Dallas.

3-4 University of Kansas, ninth annual gas measurement institute, National Guard Armory, Liberal, Kans.

4-6 American Association of Oilwell Drilling Contractors, annual meeting, Rice Hotel, Houston.

4-6 American Society of Mechanical Engineers, process-industries conference, Shamrock-Hilton Hotel, Houston.

4-6 American Society of Photogrammetry, semiannual convention and technical exhibit, Biltmore Hotel, New York.

5-7 Southwestern Legal Foundation, American Association of Petroleum Landmen, third national institute for petroleum landmen, Dallas.

6-8 New Mexico Geological Society, annual field conference, geology of the Albuquerque country, registration Oct. 5, University of New Mexico, Albuquerque.

8-11 Society of Petroleum Engineers of AIME, annual fall meeting, Memorial Auditorium, Dallas.

12-13 California Natural Gasoline Association, annual fall meeting, Lafayette Hotel, Long Beach, Calif.

15-17 National Association of Oil Equipment Jobbers, annual convention and trade show, Mayflower Hotel, Washington.

15-18 American Petroleum Credit Association, annual conference, Shamrock-Hilton Hotel, Houston.

17-19 American Society of Mechanical Engineers, American Society of Lubricating Engineers, lubrication conference, Morrison Hotel, Chicago.

18-20 Rocky Mountain Oil and Gas Association, annual conventon, Denver-Hilton Hotel, Denver.

18-21 American Association of Petroleum Geologists, Mid-Continent regional meeting, Amarillo, Tex.

19 West Central Texas Oil and Gas Association, annual meeting, Hotel Windsor, Abilene, Tex.

19-21 National Society of Professional Engineers, fall meeting, Hotel Roanoke, Roanoke, Va.

20 American Institute of Chemical Engineers, South Texas section, annual technical meeting, Moody Civic Center, Galveston, Tex.

19-22 Louisiana Gulf Coast Oil Exposition, Lafayette, La.

3 billion...

Twice as many people on earth today as 50 years ago. Within the next half century, population expected to double again! How will the earth feed, clothe, house, these teeming millions?

Through energy! Fuel energy! To grow the food, produce the goods the world must have to meet the needs of its increasing population and lift its living standards. Man cannot add an acre to the earth. But energy will add life to every acre he does use.

TIME BOMB

We explore for, produce oil and natural gas from northern Canada to the southernmost tip of South America. We refine and process oil and natural gas and market their products in 24 states. Each year we supply more and more of the energy on which the future depends.

TENNESSEE GAS TRANSMISSION COMPANY

FROM NATURAL GAS AND OIL...HEAT, POWER, PETROCHEMICALS THAT MEAN EVER WIDER SERVICE TO MAN

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NEW BARTON 273 PNEUMATIC TRANSMITTER MEETS MORE APPLICATION REQUIREMENTS THAN ANY OTHER TRANSMITTER

The Barton 273 offers the widest differential pressure ranges (0-8″ w.c. to 0-400 psi), the highest safe working pressures (to 10,000 psi), and the widest variety of housing materials (aluminum, brass, steel, 316 stainless steel). It's compact, weighing up to less than ½ the weight of other units. It has adjustable suppression up to 80% of DP range, and adjustable span. A non-bleed relay minimizes air consumption. It doesn't shift zero on overrange. It's unaffected by normal piping stress. In every respect, the Barton 273 is the most significant advance in pneumatic transmitters in the past decade. There's a lot more you should know about it—for complete data write

BARTON

INSTRUMENT CORPORATION, 580 MONTEREY PASS ROAD, MONTEREY PARK, CALIFORNIA.

24-25 University of Kansas, Southwest Kansas Center, sixth annual natural-gas pipeline institute, Court House, Liberal, Kans.

24-25 Pennsylvania Grade Crude Oil Association and Pennsylvania State University Mineral Industries Experiment Station, technical conference on oil recovery by solvents, Pennsylvania State University campus, University Park.

24-27 National Association of Corrosion Engineers, south-central region conference and exhibition, Shamrock-Hilton Hotel, Houston.

25-26 National Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

25-27 Gulf Coast Association of Geological Societies, annual meeting, Granada Hotel, San Antonio, Tex.

27 Natural Gas Processors Association, southern regional meeting, Carlton Hotel, Tyler, Tex.

29-31 Independent Petroleum Association of America, annual meeting, Shamrock-Hilton Hotel, Houston.

29-Nov. 1 National Lubricating Grease Institute, annual meeting, Rice Hotel, Houston.

NOVEMBER

1-3 Southwest Federation of Geological Societies, annual meeting, Hilton Hotel, El Paso, Tex.

2-3 Society of Petroleum Engineers of AIME, annual California regional meeting, Hacienda Motel, Bakersfield, Calif.

2-3 API, annual agriculture - petroleum seminar, Louisiana State University, Baton Rouge.

2-4 Geological Society of America, annual meeting, Cincinnati, Ohio.

5-9 Society of Exploration Geophysicists, international meeting, Denver.

6-8 Chemical Institute of Canada, conference of the chemical engineering division, Royal York Hotel, Toronto.

9-10 Society of Automotive Engineers, national fuels and lubricants meeting, Shamrock-Hilton Hotel, Houston.

13-15 American Petroleum Institute, forty-first annual meeting, Conrad Hilton, Congress and Palmer House hotels, Chicago.

16 Illinois Oil and Gas Association, annual meeting, Mount Vernon, Ill.

17 Natural Gas Processors Association, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

26-Dec. 1 American Society of Mechanical Engineers, winter annual meeting, Statler-Hilton Hotel, New York City.

DECEMBER

3-6 American Institute of Chemical Engineers, annual meeting, New Yorker Hotel, New York City.

4 AIME's Society of Petroleum Engineers, Arizona section, annual meeting, Pioneer Hotel, Tucson.

4-6 Interstate Oil Compact Commission, annual meeting, Denver Hilton Hotel, Denver.

5-6 National Petroleum Refiners Association, computer conference for refiners, Hotel Tulsa, Tulsa.

JANUARY

7-10 Pipe Line Contractors Association, annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

8-12 Society of Automotive Engineers, annual meeting, Cobo Hall, Detroit.

16-18 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville, Ky.

think of the costly rig time the Johnston FAST tool will save you!

F–A–S–T:

Frac — Acidize
Squeeze — Test

"FAST" — that's the name of the Johnston full-bore test and completion tool. With one trip in the hole: Recover formation fluid and pressure charts at any time; conduct an actual production test; take unlimited bottom hole shut-in pressures **without returning test section to surface;** squeeze, re-perforate and test all zones; acidize or frac with high fluid volumes.

The FAST Tool will save you round trips and costly rig time. Contact your Johnston Testers Man or write:

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Progress?

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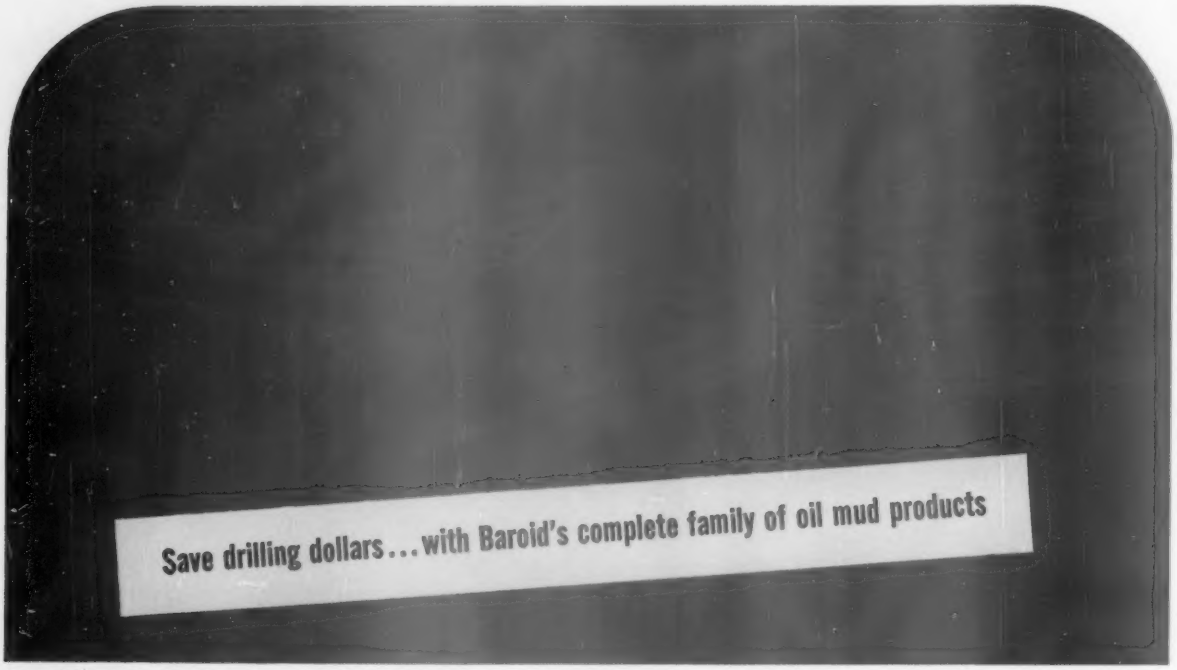


Baroid Field Report: Terrebonne Parish, Louisiana. This case history exemplifies the use of one type of Baroid Oil Mud to solve this particular problem.

Baroid Oil Mud solves deep drilling problem (BHT 300 F)

In a recently completed well in the Hollywood Field, Terrebonne Parish, Louisiana, a Baroid Oil Mud containing INVERMUL*, DURATONE** and PETROTONE* was used as the practical solution to the problem of drilling a 5¾ inch hole at depths to 16,500 feet and temperatures to 300 F.

Tight-hole conditions had been experienced while drilling to 15,000 feet and a 7 inch OD liner to be set (in 8¾ inch hole) at this depth was stuck at 14,327 feet. A Baroid Oil Mud was selected to drill the bottom 1,470 feet of hole because of the excellent control of flow properties, hole stability and lubrication that would be attained. API filtration could be held at zero, filtration at anticipated bottom-hole temperature of 275 F to 300 F could be easily controlled, and flow properties comparable to water-base muds could be achieved.

At 14,327 feet the water mud in the hole was displaced with approximately 1,500 barrels of pre-mixed 17.5 ppg Baroid Oil Mud. The 7 inch liner was cemented, cement was drilled, and reaming to bottom was begun. While reaming to bottom, the water mud (about 5% of total mud volume) was incorporated into the Baroid Oil Mud with no difficulty.

The 5¾ inch hole was drilled from 15,100 to 16,570 feet at about the same penetration rates normally attained with water muds. Periodic additions of diesel oil, INVERMUL emulsifier and DURATONE filtration control agent maintained the excellent filtration and flow properties of the oil mud. Drilling was trouble-free and a 4½ inch OD liner was successfully set at 16,570 feet.

PETROTONE was used to treat this oil mud to eliminate the possibility of any settling of BAROID* at the high bottom-hole temperature. DURATONE controlled filtration at zero API.

Baroid Oil Muds, product of Baroid research and engineering, save your drilling and completion dollars . . . keep your drilling program on schedule. For more information on the unique properties and flexibility of Baroid Oil Muds, write for Product Data Sheets.

BAROID

BAROID DIVISION NATIONAL LEAD COMPANY

MAIN OFFICE: P. O. BOX 1675, HOUSTON 1, TEXAS

BAROID—*Still Pioneering Drilling Mud Research • Engineering • Marketing*

*INVERMUL, emulsifier; PETROTONE, suspending agent; and BAROID, weight material; are Registered Trademarks of Baroid Division National Lead Company.
**DURATONE, filtration stabilizer, is a Trademark of Baroid Division National Lead Company.

6173

the Journal said ...

50 years ago

September 14, 1911

Assistant Secretary of the Interior Samuel Adams, will meet producers of oil in the Mid-Continent field at Washington on October 5 to consider matters of interest in that field and to investigate the question of the Department's authority in regulating the price to be paid for oil. An effort will be made to send a committee of producers, representing the Mid-Continent Oil Producers Association, who will discuss the matters with the Secretary.

25 years ago

September 10, 1936

The trustees of Findlay's Golden Celebration of Gas and Oil, Inc., announce the election of O. D. Donnell, president of Ohio Oil Co., as president of its organization. Findlay's Golden Celebration of Oil and Gas is set for June 1937, and will mark the 50th anniversary of a celebration held in Findlay at the peak of the gas boom. So abundant was the gas supply then, it was possible to heat a home for $1.05 per year.

10 years ago

September 13, 1951

The electronic brain has found many applications in the oil industry, but the surface of its potential is hardly scratched, according to Magnolia Petroleum Co. This Dallas company has geared the brain to automatic printing machines to handle a large part of its everyday tabulating problems. Magnolia's extensive research labs are finding ways of applying its high-speed calculation to the compilation of data for solving the unknown in problems pertaining to reservoir analysis.

Venezuela's oil industry is engaged in a large expansion program, and the government is proud to declare that the country's oil will continue to contribute in the measure that might be necessary to help in the struggle to preserve western civilization, Dr. Santiago E. Vera, Minister of Mines and Hydrocarbons, told delegates to the first National Petroleum Convention in Caracas.

Canadian Superior Oil of California, Ltd., made its first Devonian reef oil discovery in Canada at a wildcat in the New Norway area of Central Alberta. Other exploratory notes for the week included an important wildcat in northwestern Oklahoma. Sinclair Oil & Gas Co. found promising oil and gas shows at its 1 Campbell in northwestern Major County. Location of this possible Mississippian discovery is 30 miles northwest of Ringwood field, closest production.

JOURNALLY SPEAKING

Oil Patch Mal de Mer

HAVE YOU ever been seasick? Really cold-sweating, upchucking, eyeball-rolling seasick? If not, we don't wish it on you. If you have, shake hands with a charter member of the fraternity of inverted stomachs.

We had a really nerve-shattering experience just a few weeks ago. Petroleos Mexicanos and CIMA (Pauley Pan American and Continental Oil) invited us down to Mexico's State of Tabasco to visit Santa Ana offshore field. It's a long way from Houston and there wasn't time to drive. So we flew.

Whenever we approach anything with wings, we have a conditioned reflex that makes us pat our pocket to see if our bottle of Dramamine is safely in place. It's saved us from losing our lunch many a time.

At Reynosa, the Pemex plane waiting for us had but a single engine, so we took a double dose. It worked. Six hours later, at Santa Ana, we could look across the water at CIMA's big platform close by Reading & Bates' gigantic mobile barge, Mr. Louie, and Zapata Offshore's floating driller, Nola I. It was an impressive spectacle, if one could forget the boat ride necessary to get out there.

Next morning was calm, so we confidently boarded the outgoing boat with just the normal dosage. Journal editors often double as photographers. To keep our hands free, we put everything we could into our pants pocket—lens hood, filters, flash bulbs, etc. And, of course, our Dramamine.

All day we scurried over the platforms and barges, taking pills, shooting pictures, taking pills, asking questions, and taking—er—notes. About the middle of the afternoon, we stood on the deck of a crewboat, maneuvering to get a better camera angle on Mr. Louie. As we pulled the lens hood from our overloaded pocket, we heard something hit the deck at our feet. We looked and saw nothing, so we carried on.

Came pill time again. You guessed it. That's what we heard drop to the deck. Panic gripped us. Should we dive in and swim the 5 miles to shore? We finally decided to stay, though even the three sharks we'd seen circling about had little influence in our decision.

When the crewboat put us off on Mr. Louie, the steady deck helped restore us, but we still had to sit down for a spell—on the downwind corner, of course.

We'll skip the trip back to shore that night.

By the time we got to our bunk, despair was complete. The chance of buying Dramamine in the palm-thatched village of Santa Ana was as remote as finding icebergs in the Persian Gulf.

Next morning, while shaving, we calculated how long it would take to walk back to Houston. We hadn't brought money for a train or bus and we sure weren't going to use that return plane ticket. Then, what should we discover in the bottom of our shaving kit but a half-full bottle of Dramamine—where we'd tossed it after the last offshore trip in Louisiana. We couldn't have been happier if Pemex and CIMA had given us Santa Ana. We'd live to see our wife and kids once more.

An experience like this leaves its mark on a man. But it could be worse. Fate could have arranged for us to work for Aviation Week or Marine Engineering Log.

—Ed McGhee

First joint of Pittsburgh Steel casing is ready to enter hole drilled near the 1907 scene pictured below.

THE ROUGHNECKS WORE DERBIES

Roughnecks casually pour nitro into well preparatory to shooting in the early Bradford field in Pennsylvania about 1907.

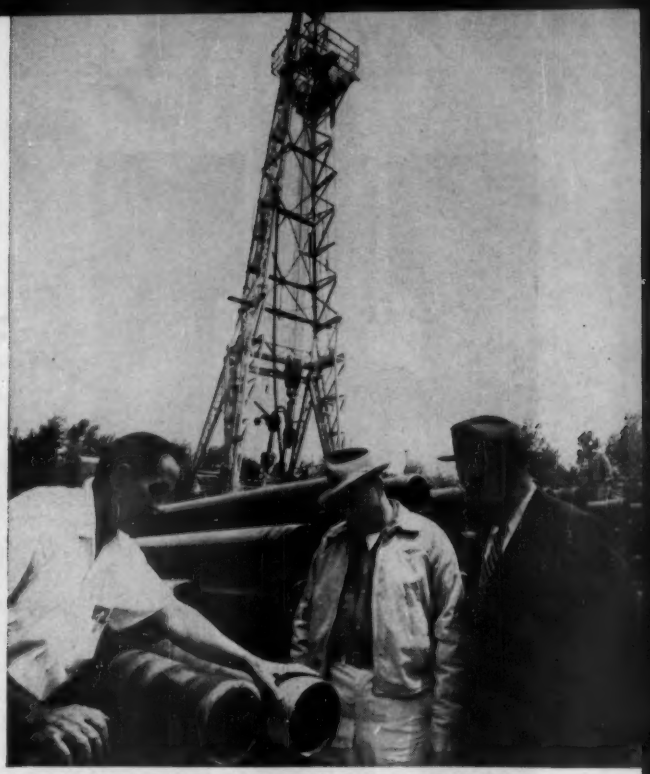
Pioneer Independent Distributor Now Sells Pittsburgh Steel Oil Country Goods From New York To Texas

Roughnecks wore derbies and horsepower had tails when one service-minded Pittsburgh Steel Co. independent distributor began operations in the pioneer Pennsylvania grade field.

Today, 54 years later, his flexibility, imagination and personal service still make the difference.

This typical "Mr. Independent" now provides oilmen in eight states with seamless tubular products

Roughneck cleans threads on Pittsburgh Steel seamless casing before running it into hole. Independent distributor who sold this casing has handled Pittsburgh Steel's tubular goods for nearly a quarter-century.



Inspecting joint ends are Peter E. Douylliez, Pittsburgh Steel Co. field engineer; Homer Ferringer, foreman for Manufacturers Light & Heat Co.; and Mark Wagner, salesman for distributor.

made by Pittsburgh Steel Co., a pioneer in its own right, whose experience with oil country goods goes back to almost the turn of the century.

• **From Soft Hats To Hard Hats**—As an early distributor whose history started in 1907, this Mr. Independent grew and flourished with the expanding industry and his stores followed the new fields across two-thirds of the continent.

Now he supplies oilmen in Texas, Oklahoma, Michigan, Pennsylvania, New York, Indiana, Kentucky and Illinois.

Three generations of the same family have run the business with the grandson of the founder now in the president's office.

With service and good products as a foundation, this distributor built up a wide range of shop facilities and repair equipment until now he is unique in the field. Nearly a quarter-century ago, he began supplying his customers with seamless tubular products made by Pittsburgh Steel Co., also a pioneer in its field. Let Mr. Independent tell you himself why these two veterans—an independent distributor and a mill that sells only through non-captive outlets—work together so well.

• **Lots Of Help**—"We get awfully rough competition from some of the big fellows. But we make out by being flexible, imaginative and by giving personal service.

"Pittsburgh Steel gives us a lot of help. The mill bends over backward to cut red tape and it moves fast when it's necessary to get some quick action."

You can't do better than making a connection with an independent Pittsburgh Steel distributor. His only obligation is to his customers.

For your next order of drill pipe, casing or oil well tubing, get in touch with one of the Pittsburgh Steel independent distributors listed below.

Distributor Home Offices

Atlas Bradford Company
Houston, Texas

Bennett Supply Company
Midland, Texas

Buckeye Supply Company
Zanesville, Ohio

C. W. Cotton Supply Company
Tulsa 5, Oklahoma

Franklin Supply Company
Denver 10, Colorado

Houston Oil Field Material Co.
Houston, Texas

Industrial Supply Company
Wichita Falls, Texas

Iverson Supply Company
Dallas 1, Texas

Longhorn Supply Co., Inc.
Houston 14, Texas

Lucey Export Corporation
New York 7, New York

Lucey Products Corporation
Tulsa 19, Oklahoma

McJunkin Corporation
Charleston 22, West Virginia

Midland Supply Company
Wichita 7, Kansas

Mountain Iron & Supply Co.
Wichita 2, Kansas

The Producers Supply & Tool Co.
Fort Worth 2, Texas

Sandy Supply Company
Wooster, Ohio

Southwest Supply Company
Pittsburgh, Pennsylvania

The Straker Supply Company
Jackson, Michigan

Superior Iron Works & Supply Co.
Shreveport, Louisiana

Tex-Tube, Inc.
Houston 7, Texas

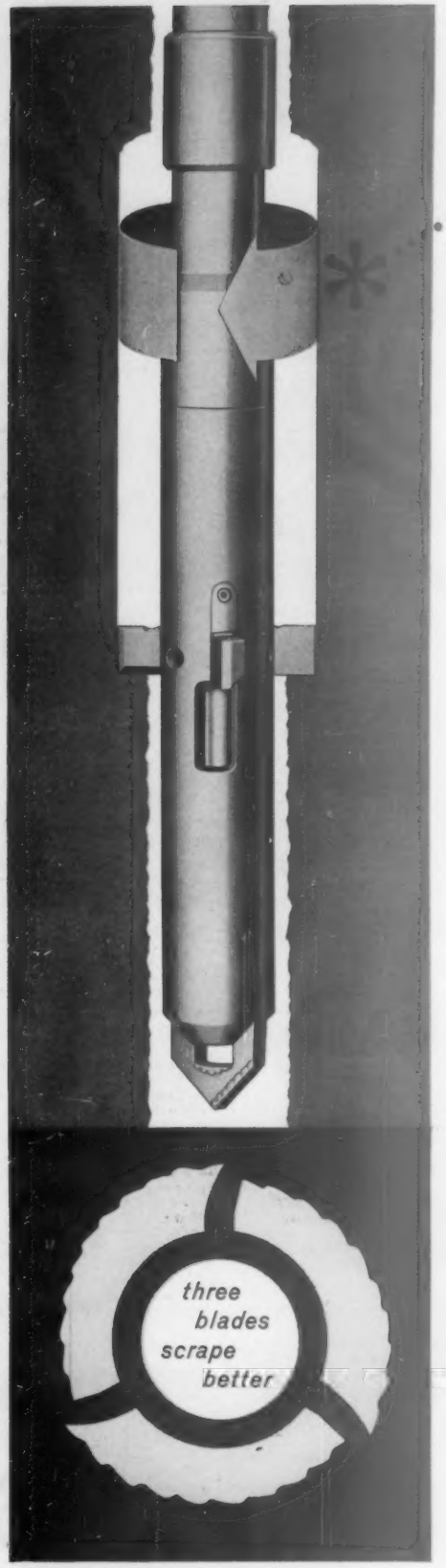
Western Supply Company
Tulsa 1, Oklahoma

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

DISTRICT SALES OFFICES

Atlanta	Cleveland	Dayton	Los Angeles	Pittsburgh
Chicago	Dallas	Detroit	New York	Tulsa
		Houston	Philadelphia	Warren, Ohio



To economically enlarge open hole at any point...

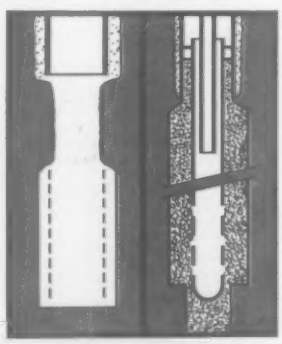
THE BAKER MODEL "B" THREE-BLADE WALL SCRAPER

WITH ITS BLADES RETRACTED, this sturdy scraper safely runs through the casing. When the desired point of enlargement is reached, application of circulation pressure forces the blades to swing open. The hole may then be enlarged to a maximum diameter considerably greater than that of the casing through which the scraper is run. When the scraping is completed, circulation pressure is removed and the blades retract automatically for safe removal from the hole. The entire operation is simple, safe and effective.

The Baker Wall Scraper has been successfully used for many years in a great variety of practical applications. Some of the most important of these are: Cleaning up oil sands, setting cement plugs, setting liners, enlarging holes for gravel packing.

The three-blade model provides a smoother, more efficient cutting action than two-blade scrapers. It is available in five sizes to run through 5½" OD and larger casing. A complete range of cutting blades provides reaming capacity from 5¼" to 22". Special diamond-point and bull noses can be supplied.

Consult your Baker Representative for complete information on this simple to operate, simple to service tool.



TYPICAL APPLICATIONS

At left: Scraping the face of the oil sand to remove mud cake and enlarge the bore of the producing zone.

At right: Gravel Packing is easily and effectively performed when the hole has been enlarged with a Baker Wall Scraper.

BAKER

MODEL "B" THREE-BLADE WALL SCRAPER PRODUCT 512-B

BAKER OIL TOOLS, INC. / HOUSTON / LOS ANGELES / NEW YORK

Caplin out of order in percentage-depletion attack

MORTIMER CAPLIN, commissioner of the Internal Revenue Service, sounded off the other day about oil's percentage depletion.

The way he sees it, if there must be government help for oil producers, it should be in the form of an outright subsidy voted by Congress.

This was not the first time Caplin had expressed such a view. Nor is it exclusive with him. Others, including some college economics professors, have advocated the subsidy approach off and on through the years. The fact that no one has paid much attention apparently has not discouraged them.

CAPLIN'S REPETITION of the attack on percentage depletion is noteworthy now chiefly because he is head of IRS and because he apparently is making something of a campaign out of it.

It is not uncommon for a government bureaucrat to give voice to the party line, espoused by the administration or by his party leaders in Congress. In this situation, however, Caplin is standing alone. The administration has made no attack on percentage depletion, nor is any hearing under way on the subject in Congress.

Caplin readily concedes that tax policies are drafted by the Treasury Department and the administration, and that tax laws are written by Congress. His job is to administer those policies and laws. But he obviously does not feel that this prevents him from sounding off.

It would seem that the proper course for him to take would be to suggest changes to Treasury officials, or even to Congress. But if he has done this, his proposals have been ignored.

If Caplin wants to continue attacking percentage depletion, perhaps he would agree to a public debate on the issue with some recognized authority on the subject—such as Dr. Richard Gonzalez of Humble Oil & Refining Co. or Scott Lambert of Standard Oil Co. of California. That would seem much fairer than the hit-and-run jabs he has been taking when there was no one present to answer back.

In December 1959, Gonzalez and Lambert appeared on a panel to discuss percentage depletion at a hearing by the House Ways and Means Committee. One of the points raised by a professor member of the panel was this business of a subsidy.

GONZALEZ AND LAMBERT scoffed at this. Lambert pointed out that under a subsidy the efficient and inefficient get treated alike.

"Unlike that, the depletion allowance rewards the most efficient and the most successful in direct proportion to their success," he said.

Furthermore, Lambert said, a subsidy would cost the taxpayer much more than the alleged cost of percentage depletion.

Lambert's statement was made in a setting where he could have been challenged by other members of the panel or by the congressmen on the committee—a quite different setting from Caplin's plane-side remarks to reporters at a Dallas airport.

Dowell Acidizing

-- lowest cost way to stimulate many oil and gas wells.

Pioneer in the field of acidizing, Dowell has constantly improved both the engineering of acid treatments, as well as the products and services themselves. Here are some of the important field proved acidizing services offered by Dowell to help you get the best possible results.

RETARDED ACIDS — slow-acting acids designed to penetrate deeply before spending. They are used to improve production from fast-reacting, vugular, oolitic, or naturally fractured formations.

MUD ACID — a special acid solution that dissolves and disperses mud on screens, liners, perforations and the pay. It also increases permeability of certain sand formations which have low solubility in regular acid.

BDA* BREAKDOWN ACID is designed to penetrate and disperse mud cakes by reducing surface tension, by preventing and breaking emulsions and by removing water blocks. It is often used to break down formations ahead of fracturing, cementing and conventional acidizing treatments.

SILICATE CONTROL ACID has special agents added to prevent the swelling of clay minerals and other formation silicates. It also prevents or breaks certain emulsions.

STABILIZED ACID contains an additive to prevent the formation of formation-plugging iron hydroxide precipitate. Many troublesome water injection wells have been successfully treated with Stabilized Acid.

ADDITION AGENTS are available to reduce surface tension, prevent or break emulsions, remove or prevent the formation of compounds that might plug the formation, and speed up or slow down acid reaction with the formation.

Acids may be tailored to the requirements of a specific well by the use of one or more Dowell addition agents.

MANY AUXILIARY DOWELL SERVICES are available to help make acidizing treatments more effective. These services include Abrasijet* abrasive jetting service and a number of diverting agents for selective or multiple zone acidizing.

SEVERAL FRACTURING SERVICES that employ acid-base fracturing fluids are offered by Dowell. Often, wells fractured with acid-base fluids give higher production or flatter decline curves than could be expected from either acidizing or fracturing alone.

THE ACID GUIDE* — Dowell's method for planning and predicting the results of acidizing treatments — helps operators get the most profitable treatments for their wells.

For greatest profits, check on Dowell field-proved acidizing for every well you plan to treat. Ask your Dowell representative for full information. Dowell services and products are offered in North and South America, Europe, North Africa and Iran. Dowell, Tulsa 14, Oklahoma. *DOWELL SERVICE MARK

SERVICES FOR THE OIL & GAS INDUSTRY

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

Fairway: Biggest New Field in Years

• This year-old development, smack in the middle of the old producing area of East Texas, already is the biggest thing since Aneth. If some optimists' estimates are sound, it will wind up in a class with Van and Hawkins.

Robert J. Enright
Southwest Editor

WHO SAYS the giant fields have all been found in old producing areas?

It isn't so.

If you doubt it, just take a good look at Fairway field in East Texas. This one has the whole domestic oil industry agog.

It's now apparent that Fairway is the biggest oil reserve found in the U. S. since Aneth—and before it is through it may prove even bigger.

Some geologists are already terming this Henderson-Anderson counties pool as possibly the biggest U. S. discovery in the past 10 to 15 years.

It dwarfs anything found in East Texas since Neches in 1953. And some of the best-informed geologists and engineers active in the field say Neches can't compare.

They estimate ultimate recoverable reserves at Fairway now as high as 400,000,000 bbl. of oil.

If this is so, this new field will rank right in there with such monumental East Texas oil giants as Van and Hawkins (discovered in 1929 and 1940)—bowing only to the biggest of them all, East Texas field.

Fairway just celebrated its first birthday in July.

The status now . . . But operators there already have proved up roughly 40 sq. miles of thick James reef pay since Fairway Operating Co. completed its 1 Wofford (A on map) to kick off the boom.

As of last week, the big field boasted an even 50 completions sprawling over a proved and semi-proved area variously estimated at between 20,000 and 25,000 acres.

At last count, there were nine more holes going down and another eight about ready to start. There may be 80 or more completions in the field before the year is out.

And the field still isn't defined.

The bounds apparently have been reached in some directions. But there appears room for substantial extension yet in others.

Here's the rough picture now:

Dry holes definitely limit the field on the southwest, the east, the northeast, and the northwest.

There's more reef to develop to the south and southeast, to the west, and to the north.

Opening the north door . . . Right now the north is most promising.

Atlantic Refining Co. is due the credit for this. Prior to late August it had seemed definition might be near in this direction, too. Now Atlantic's 1 R. Truitt in Juan Jose Martin Survey (B on map) has scrambled this idea.

This well, the northwesternmost in the field, appears one of the most significant to date. Atlantic previously had cut two down-to-the-northwest faults in both its 1 Bruton and 1 Evans Oil unit (C and D) to the east. Both, however, were completed in the reef on the upthrown side of these faults. This left a big questionmark for the 1 Truitt to answer.

And it answered it happily. It is being completed on the upthrown side of the shallower 75-ft. fault but on the downside of a more-important major 280-ft. comrade. The well has at least 70 ft. of clean, oil-loaded textbook reef. It topped the reef at a −9,581 ft., as compared to a top of −9,300 ft. in the neighboring 1 Bruton only a half mile to the east.

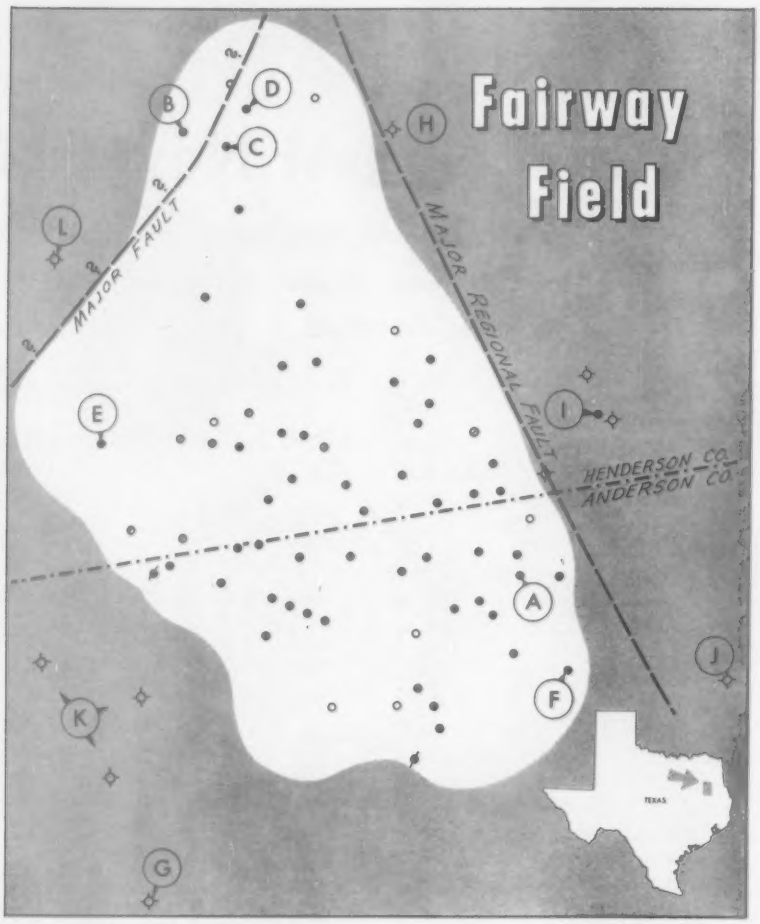
A drill-stem test of the top 20 ft. of reef from 9,581-9,601 flowed water cushion and 500 ft. of free oil

How Fairway Compares With East Texas' Giants

Field name and county—	Disc. year	Pay zone	Millions of bbl. Cum. prod.	Est. total prod.
Fairway—Anderson and Henderson	1960	James reef	. . .	150-400
Van—Van Zandt	1929	Woodbine primarily	292	405
East Texas—Gregg, Upshur, Smith, Rusk, and Cherokee	1930	Woodbine	3,455	5,100
Powell—Navarro	1923	Woodbine primarily	127	130
Mexia—Limestone	1920	Woodbine	104	107
Hawkins—Wood	1940	Woodbine and Sub-Clarksville	260.9	525
Talco—Franklin and Titus	1936	Paluxy	174.1	250
Neches—Anderson and Cherokee	1953	Woodbine and Sub-Clarksville	17.6	185

Probably one other East Texas field will make this list. This is Quitman field in Wood County. Discovered in 1942, it produces from the Woodbine, Sub-Clarksville, Paluxy, and Rodessa. It has produced roughly 45,000,000 bbl. and is credited with a remaining reserve of 35,000,000. New production brought in in the past year, however, makes it almost certain this field eventually will surpass the 100,000,000-bbl. mark—the accepted definition for a "giant" oil field.

STARTLING STEPOUT was Atlantic Refining's 1 Bruton (C on map), which extended Fairway 3 miles to the north and found more than 100 ft. of James reef pay.



QUICK LOOK at Fairway field development to date shows there have been 50 producers completed. There are now nine wells drilling and locations already staked for eight more wells. There are known faults on the east and west, but the north and south limits are undefined.

in 25 minutes with no water. Coring operations finally indicated "we might be getting into water in a 17-ft. core cut between −9,651 and −9,668 ft.," an Atlantic geologist told the Journal last week. This would indicate a water table 100 ft. or so lower than across the fault to the south.

Completion of this well points to probable extension not only due north but more to the northwest, too. And there is nothing to date to show where it might stop.

What makes this doubly important is that the reef section in this portion of the field is as thick or thicker than almost any other in the huge pool. Net pay in both the Bruton and Evans Oil unit wells was right at 100 ft.

And it is prettier, cleaner reef. To the south, the pay is more broken and intercrystalline.

Other important stepouts . . . Faulting probably will be much less a factor on the west and southeast fronts. But geologists wouldn't bet heavily on that either.

After the Atlantic test, the hottest recent drilling news in Fairway was made by Hunt Oil Co. and B. F. Phillips.

Hunt stepped out 1¼ miles due west to extend the field with its 1 West Poyner unit (at E) in Isaac W. Burton Survey.

Phillips pushed field limits on to the southeast with his 1 G. E. Dickerson (at F) in Jose Chirino Survey. The 1 Dickerson, the first well completed south of the Frankston city limits, gaged 372 bbl. daily through 12/64-in. choke from 9,880-90 ft.

An upcoming test certain to be watched closely has been located by Bonanza Oil Co., 3½ miles due south of the southwesternmost wells in Fairway. It is Bonanza's 1 Turner Lang unit in Jose Pineda Survey (G on map). Scheduled for 11,000 ft. to the Travis Peak, the test may throw more light on geological suspicions that some sort of saddle exists between Fairway and Isaac Lindsey field to the southwest.

9 by 5 miles now . . . Productive Fairway James reef now has spread over an area 9 miles long and 5 miles wide at its widest point.

Available evidence points to a major regional fault trending in the same direction to form the field's east boundary.

On the north due east of Atlantic's prolific wells, Cities Service drilled its 1 Xenia Miller as a duster in Thomas Chaffin Survey, finding only a few feet of reef. Existence of the fault had been definitely proved farther to the south in early Fairway

drilling. Here Cities Service's 1 White (I on map), the 1955 discovery of Frankston James Reef field, is surrounded by three dry holes and is still a one-well field.

Still another duster was completed this summer about 3 miles farther southeast at W. R. Hughey et al. 1 H. F. Marr (J on map) in J. F. Timmons Survey across the line in Anderson County.

On the southwest side of the field, three Fairway failures (K on map) found the reef low and productive only of salt water.

And on the northwest, Armer & Nelms (at L) drilled an important duster in William J. L. Scott Survey. Its 1 Greer came in very low to confirm the existence of a large fault somewhere between it and the field proper.

Paying out fast . . . It's costing operators from $125,000 to $140,000 on the average to drill these 10,000-ft. Fairway producers. But they're getting it back fast.

The field is one of only about half a dozen oil pools in Texas with 160-acre spacing. A field well, taking from 30-40 days to drill, on this spacing gets an allowable of about 333 bbl. per producing day.

Presuming an average of 9 producing days per month, these prolific reef wells will pay out in less than 2 years—probably closer to 1½ years. This includes royalty and taxes.

From then on, it's gravy. "Then on," according to one field operator, "may be 100 years if pressure maintenance operations are started relatively soon as planned."

Fairway producers are estimating field primary reserves now all the way from 60,000,000 to 200,000,000 bbl.

Pressure program coming . . . It's a good bet that some type of artificial drive—probably a miscible program—will be kicked off about 2 years from now.

Operators have been planning for it since shortly after the discovery.

Efforts to unitize the field already are under way. And the haggling over a participation formula has begun.

Wide spacing was granted by the Railroad Commission partly as an aid to operators to prove up the field quickly, launch pressure maintenance operations, and thus maximize the oil recovery while pressure remained high.

It appears likely that Fairway Operating Co., as probably the largest holder of proved acreage, will be named operator of the unit.

Fred Oliver, partner in Oliver & West, consulting engineer-geologists for Fairway Operating in Dallas, tells the Journal that the odds now appear in favor of a miscible drive of the high-pressure-gas variety as the unit secondary-recovery mechanism.

"We're still developing reserves data to determine which kind of program will be most effective. But we've seen nothing to date to indicate that high-pressure gas won't be the best."

Reserves ballooning . . . Primary reserves for Fairway, Oliver estimates, are probably around 60,000,000 bbl.

This figure is based on a primary recovery of about 17½% of total oil in place and an average of 50 ft. of net pay over the field.

The Dallas engineer estimates that the upcoming artificial drive could boost this to possibly as high as 240,000,000 bbl.

Some other operators in the field are even more optimistic.

Atlantic Refining Co., for instance, estimates primary as high as 200,000,000 bbl., with secondary operations netting possibly that much more. Atlantic, similarly, is expecting net pay over the field to average out thicker—running perhaps as high as 75 ft.

In the Atlantic area to the north where the pay is more of a true reef, porosity averages around 13 to 14%. Permeability varies all the way from 0 to 230 md. and averages roughly 40-50 md.

Gas-oil ratios are running usually around 1,300:1 to 1,400:1. And bottom-hole pressures average about 5,200 psi., with little drawdown yet from production.

So far, all gas is flared. But plans are in the works for central tank batteries, automatic producing facilities, and central and possibly satellite separating plants which will conserve the gas and make Fairway one of the most modern streamlined producing operations in the U. S.

Production climbing . . . Fairway produced 80,000 bbl. of oil in May. And its output now is running about 13,500 bbl. daily and climbing fast.

So far all oil is trucked from the field—most of it by Scurlock Oil Co.

Pure Oil Co., however, is laying a line into the field and will soon tie it into existing facilities at its Bullard station.

Along with the flood of oil from the James reef, Fairway also is producing crude from the shallower Rodessa and Massive Anhydrite pays. But this is skimpy, stringer stuff coming from only a handful of wells mostly in the southern part of the field. Net pay in either zone has not surpassed 3 ft. to date.

Principal holders of proved acreage in the big field so far are Fairway Operating, Atlantic, Cities Service, Hunt Oil Co., and Humble Oil & Refining Co.

Fairway Operating is a partnership formed by Tom Clay, Athens geologist, and John Prothro, Tyler attorney and oil operator. Initial geological work leading to the Fairway discovery was Clay's. The company took more than 8,000 acres of leases on the basis of this work. And it appears now the great bulk of it is going to be productive, and highly so.

Heavy impact . . . Here, in Fairway, is a strike certain to hit geological thinking, not only in East Texas but in other old producing areas, like an earthquake.

It is right in the middle of one of the most heavily drilled parts of a heavily drilled oil region—just a good long stone's throw from such oil giants as East Texas, Van, and Hawkins.

Yet, it wasn't found until 1960. Who's to say there aren't more like it—perhaps just a good long stone's throw away?

Next Week: More Reefs?

Are there other James Reef fields hiding in East Texas? Some companies think so, and they're starting the search.

Next Week Journal Editor Bob Enright reports on the prospects for further James Reef discoveries, the difficulties in finding them, and the areas where companies are now looking.

Turnagain Pipelaying Was Tough . . .

. . . Because of Big Tidal Swells. Now . . .

Alaskan Gas Line Is Finished

THE CITY of Anchorage is now receiving its first natural gas by pipeline.

Alaska Pipeline Co., which has headquarters in Houston, has completed the tough construction job of spanning Turnagain Arm off the Cook Inlet and has hooked up the 12¾-in. line with the partially completed Anchorage distribution system.

The gas comes from Kenai Peninsula wells of Union Oil Co. of California and Ohio Oil Co.

The company says the local distribution system will be increased in size over a period of 3 to 5 years as demand requires. Anchorage Natural Gas Corp., the distributor, is a subsidiary of Alaska Pipeline.

Construction on the $20-million pipeline began a year ago. Work was suspended during the winter because of difficulty in spanning 8½-mile Turnagain Arm, where tides measure up to 25 ft. The photos above show how the tide floods the arm.

Sharman, Allen, Gay & Taylor did the submarine pipelaying. Williams Brothers laid the land portion of the 85-mile line.

A spokesman said Alaska Pipeline has been studying the economics of extending the pipeline to Fairbanks, a distance of 400 to 450 miles to the north.

CATC Writes Off Farthest Test Off Louisiana

THE CATC group has abandoned its wildcat located 70 miles from the Louisiana coast — the farthest offshore Louisiana well ever drilled (OGJ, July 31, p. 103).

The well went to 14,506 ft. without getting any shows worthy of testing. Located in Block 269, Eugene Island area, it was spotted about 100 miles south of Morgan City and 70 miles from the nearest point of land.

It was drilled in 181 ft. of water from a 409 ft., 2-deck platform.

Continental Oil Co., operator for CATC (Continental, Atlantic, Tidewater, Cities Service), is preparing to spud again in the far-offshore waters—this time about 20 miles to the west in Block 108, South Marsh Island area.

Canadian Firm Plans Natural-Gas-Liquids Plant Near Edmonton

STEELMAN Gas, Ltd., plans to start construction next spring on a gas-liquids plant near Edmonton.

It will be the first plant in Alberta built specifically to treat pipeline-gas streams.

Northwestern Utilities, Ltd., has signed a 25-year contract that allows Steelman to process natural gas moving to Edmonton in Northwestern Utilities pipelines. Alberta's Oil & Gas Conservation Board has approved the project.

Initial capacity of the plant when it goes into operation next fall will be 70,000 M.c.f.d. Recoveries will include 1,308 bbl. daily of propane and 464 bbl. daily of butane.

Plant site is outside Edmonton where Northwestern's two gas mains from Pembina, Lobstick, Bonnie Glen, Wizard Lake, and Glen Park fields converge.

Sales of LP-Gases by States

(Thousands of gallons)

PAD Districts and States	Total LP-Gases and Ethane 1959	1960	% Change
Dist. 1			
Connecticut	45,978	43,848	− 4.6
Delaware	12,253	11,734	− 4.2
Florida	199,972	207,260	3.6
Georgia	138,896	152,253	9.6
Maine	17,949	18,089	0.8
Maryland & D. C.	38,093	42,333	11.1
Massachusetts	46,597	47,858	2.7
New Hampshire	20,963	22,333	6.5
New Jersey	119,401	132,117	10.6
New York	117,522	119,809	1.9
North Carolina	91,987	98,343	6.9
Pennsylvania	95,727	99,556	4.0
Rhode Island	8,712	8,707	− 0.1
South Carolina	55,002	56,985	3.6
Vermont	15,961	16,946	6.2
Virginia	40,228	47,350	17.7
West Virginia	313,827	353,007	12.5
Total	*1,406,012	*1,507,886	7.2
Dist. 2			
Illinois	491,968	535,770	8.9
Indiana	231,138	232,391	0.5
Iowa	138,180	176,752	27.9
Kansas	213,715	217,757	1.9
Kentucky	127,860	140,653	10.0
Michigan	104,747	127,206	21.4
Minnesota	186,484	191,335	2.6
Missouri	234,422	249,661	6.5
Nebraska	100,146	111,299	11.1
North Dakota	46,464	50,895	9.5
Ohio	107,330	113,689	5.9
Oklahoma	283,721	305,553	7.7
South Dakota	55,956	57,537	2.8
Tennessee	48,824	55,122	12.9
Wisconsin	169,506	178,815	5.5
Total	*2,604,151	*2,813,090	8.0
Dist. 3			
Alabama	98,936	112,631	13.8
Arkansas	175,510	202,538	15.4
Louisiana	530,515	611,061	15.2
Mississippi	127,097	165,352	30.1
New Mexico	98,423	103,832	5.5
Texas	2,823,516	3,131,192	10.9
Total	*4,068,192	*4,363,118	7.2
Dist. 4			
Colorado	132,746	123,664	− 6.9
Idaho	21,757	19,110	−12.2
Montana	34,077	30,929	− 9.2
Utah	15,731	18,960	20.5
Wyoming	45,407	43,356	− 4.5
Total	*267,739	*247,805	− 7.5
Dist. 5			
Alaska	1,405	1,922	36.8
Arizona	25,777	30,393	17.9
California	386,466	406,481	5.2
Hawaii	(†)	4,702	...
Nevada	29,344	32,479	10.7
Oregon	48,906	49,786	1.8
Washington	36,055	23,022	−36.2
Total	*573,067	*612,750	6.9
Total U. S.	8,919,161	9,544,649	7.0

*Refinery fuel and secondary-recovery included in district totals only. †Not included in U. S. totals before 1960.

Chemicals Are Taking a Growing Share of LPG

THE chemical industry is still the fastest growing market for LPG and ethane in the United States.

Sales of the liquid petroleum gases for use in chemical manufacturing showed a 19.5% increase last year over 1959. Sales for domestic and commercial uses, long the dominant LPG market, gained only 7.4%, and total LPG sales increased at the rate of 7%.

While domestic and commercial uses remained the largest market by volume, 4,225,000,000 gal., chemical uses of LPG closed the gap with sales totaling 3,019,000,000 gal.

Total sales for all uses were 9,545,000,000 gal.

Over a 5-year period, the increased use of LPG in chemicals is even more spectacular. It has gained 88.6% in the period while total LPG sales were gaining only at a 43.8% rate.

Other markets where LPG showed gains last year were as refinery fuel and synthetic rubber. Sales were static for internal combustion engines and industrial uses, and they declined in gas manufacturing and secondary-recovery projects.

Use of LPG in secondary-recovery programs for declining oil reservoirs proved disappointing last year, with only 53,000,000 gal. used for that purpose. That's the lowest volume used since the data were reported separately by the Bureau of Mines. A total of 69,000,000 gal. was consumed in both 1957 and 1958, and the volume jumped to 231,000,000 gal. in 1959.

The picture of LPG sales by states shows the Middle West with an 8% increase making the best rate of gain, while the Gulf Coast

Sales of LP-Gases and Ethane by Use

(Millions of gallons)

	1956	1957	1958	1959*	1960†
Domestic and commercial	3,001	3,067	3,294	3,935	4,225
Internal combustion	773	805	852	889	898
Industrial	439	442	493	439	439
Refinery fuel	143	122	179	137	157
Gas manufacturing	212	231	239	183	157
Chemical	1,601	1,732	1,899	2,526	3,019
Synthetic rubber	418	418	372	514	539
Secondary recovery	(‡)	69	69	231	53
Other	49	53	65	65	58
Total	6,636	6,939	7,462	8,919	9,545

*Includes Alaska. †Includes Alaska and Hawaii. ‡Not reported separately before 1957.

Record runs again

REFINERS set another all-time record for crude runs in the last week of August.

The week's average was 8,564,000 bbl. daily compared with 8,558,000 bbl. the week before when a record also was set. Compared with a year ago, runs for the week gained 270,000 bbl. daily.

Largest increase was made by refiners on the Texas Gulf Coast where the gain averaged 88,000 bbl. daily. Largest reduction was made in Illinois-Indiana where the cutback was 33,000 bbl. daily.

states maintained their position for largest sales volumes. Total sales in District 2 were 2.8 billion gallons while District 3 had sales of 4.3 billion. District 4 in the Rocky Mountains showed a 7.5% decline in sales for the only drop.

Texas easily held its rank as the top market for LPG with sales totaling 3.1 billion gallons last year, a 10.9% gain over the year before.

Other high ranking states for LPG sales were Louisiana 611,061,000 gal. for a 15.2% gain; Illinois 535,770,000 gal. for a 8.9% gain; California 406,007,000 gal. for a 12.5% gain; and Oklahoma 305,553,000 gal. for a 7.7% gain.

Humble to Build New Products Line

HUMBLE Pipe Line Co. will tie in the Baytown refinery area with Central Texas by constructing a new products line.

The new 270-mile line will consist of 12 miles of existing 10-in. line, plus 165 miles of 8-in., and 93 miles of 6-in.

The line will have an initial capacity of 17,000 bbl. daily of automotive and aviation fuels. This can be increased by adding pumping facilities at three remotely controlled stations or by building new ones.

Construction will be completed early next year.

Humble said the 10-in. and 8-in. line will extend west from Baytown about 177 miles and then divide into two 6-in. lines—one of them extending 43 miles to Austin and the other 50 miles to San Antonio.

Top-Bracket Salaries in Oil

• Study shows chief executives in larger steel, automotive, chemical firms get more than oil-industry leaders.

THE CHIEF executive officers of 35 oil companies were paid an average of $129,924 last year.

Total compensation (salary plus bonus, stock plan, or other supplement) of the typical chief executive was determined largely by the size of his company as measured by sales and profits. He was paid 37% more than the second-ranking man in the company and double the salary of the No. 4 man.

He probably hasn't had a good raise lately.

If he heads a small company, his compensation in 1960 was well above the average of other industries. If he heads one of the billion-dollar giants, his pay was well below the all-industry average for firms of similar size.

He has been assured of a substantial pension, perhaps supplemented by deferred compensation provided for by contract. In this and most other matters of remuneration, the typical oil executive is remarkably like his counterpart in other industries.

These observations are derived from the seventh survey of executive compensation by McKinsey & Co., management consultants. The studies themselves may have contributed to the more uniform approach in salary policies noted in recent years.

Compensation, sales, profits . . . The correlation of compensation with sales and profits is even stronger in petroleum than in other industries, and it is becoming stronger year by year.

There are a few striking exceptions to the averages at both ends of the scale—usually high compensation in smaller companies, relatively modest compensation among the very large companies (see table).

The level of chief-executive compensation in petroleum last year was 1% higher than in 1959, and 1959 salaries were only 0.3% above 1958. This compared with no increase at all last year for the average of 25 industries studied by McKinsey, and an 8% increase in 1959.

The static condition of petroleum salaraies coincided with good sales and profit gains. Sales were up 7% in 1959 and 5% in 1960; profits were up 9% and 10% for those years. However, this was a period of recovery from the recession of 1958, when profits were down 19.8% from the record level of 1957.

The chief executive was rewarded with a 4% increase in 1958 for the exceptional performance of the previous year. This amounted to almost $5,000 from an average of $123,320. But since then his pay has advanced less than $1,700.

Oil vs. other industries . . . At the lower end of the size scale, petroleum companies tended to pay higher salaries than those in other industries. At the upper end, the opposite was true.

For example, on a $10-million sales level the salary picture looked like this:

Oil, $50,800; automotive, $39,000; chemicals, $40,000; steel, $41,000. All-industry figure was $46,700.

At the $100-million sales level, averages were:

Oil, $89,700; automotive, $86,000; chemicals, $90,000; steel, $98,000. The all-industry figure was $88,100.

Salaries ran about even at one place — roughly the $200-million sales level. But none of the oil chief executives in the multibillion dollar corporations received salaries comparable to the top men in such fields as the auto, chemical, or steel industries.

Findings indicated that in the typical billion-dollar oil corporation, the head man received $158,500 This compared with $166,300 for all industry, $192,000 in automobiles, $199,000 in chemicals, and $232,000 in steel. (By contrast, hourly petroleum workers are the

Are Below Those of Other Big Industries

What Oil Companies Paid Chief Executives in 1960

(Ranked according to total remuneration)

Company and chief executive*	Salary	Total Remuneration	Company Sales
Gulf Oil, W. K. Whiteford	$175,000	$325,012	$2,720,810,000
Standard Oil (N. J.), M. J. Rathbone	239,583	258,929	8,890,000,000
Texaco Inc., A. C. Long	250,000	256,012	2,980,308,000
Shell Oil, H. S. M. Burns	225,000	247,500	1,827,831,000
Phillips Petroleum, K. S. Adams	225,800	225,800	1,255,000,000
Standard Oil Co. of California, R. G. Follis	200,000	213,383	1,922,475,000
Sinclair Oil, P. C. Spencer	185,600	191,150	1,222,383,000
Socony Mobil, A. L. Nickerson	165,000	173,260	3,579,812,000
Cities Service, B. S. Watson	153,030	159,030	994,721,000
Continental Oil, L. F. McCollum	152,750	152,750	789,005,000
Standard Oil (Ind.), J. E. Swearingen	146,250	150,637	2,038,000,000
Richfield Oil, C. S. Jones	145,361	145,361	288,960,000
Sun Oil, R. G. Dunlop	110,026	142,112	755,426,000
Ohio Oil, J. C. Donnell II	130,000	135,200	351,979,000
Union Oil Co. of California, R. H. Taylor	125,000	130,215	532,534,000
Kerr-McGee, D. A. McGee	124,312	128,005	156,305,000
Amerada Petroleum, A. Jacobsen	125,500	125,500	102,445,000
Standard Oil (Ohio), C. E. Spahr	124,519	124,519	371,676,000
Tidewater Oil, G. F. Getty II	111,550	111,550	583,442,000
Pure Oil, R. L. Milligan	102,500	102,500	654,450,000
Atlantic Refining, Henderson Supplee, Jr.	100,000	102,499	561,205,000
Honolulu Oil, L. A. Cranson	86,850	93,104	46,944,000
Anderson Prichard, R. V. Rodman	75,000	79,500	75,276,000
Plymouth Oil, W. S. Hallanan	77,000	77,000	76,284,000
Ashland Oil & Refining, R. S. Blazer	76,508	76,508	303,673,000
Louisiana Land & Exploration Co., R. M. Youngs	66,500	70,700	44,277,000
Champlin Oil & Refining, R. Wagner	70,000	70,000	74,270,000
Sunray Mid-Continent Oil, R. W. McDowell	67,167	68,834	463,768,000
Texas Pacific Coal & Oil, H. B. Fuqua	63,000	66,600	26,057,000
Argo Oil, G. J. Mueller	65,000	65,000	14,824,000
Crescent Petroleum, W. H. Garbade	60,000	60,000	20,829,000
Sunset International Petroleum, J. D. Sterling	60,000	60,000	10,866,000
Texas Gulf Producing, L. S. Reed	59,750	59,750	18,296,000
Midwest Oil, D. R. Murphy	50,000	53,000	20,264,000
Drilling & Exploration Co. Inc., C. R. Rider	43,500	46,432	9,456,000

DATA: Proxy statements of individual companies; remuneration excludes pension contributions or contractural arrangements for deferred compensation.
SOURCE: McKinsey & Co., management consultants. *Some executive changes have been made since survey.

highest paid of any U. S. industry.)

Pay below the top . . . Petroleum follows the industry pattern in payment of executives immediately under the top man.

The No. 2 man is paid an average of 73% of the chief executive's rate (identical to the industry average), the No. 3 man 62% (compared to 61%), and the No. 4 man 50% (compared to 54%).

Pension programs . . . Pension programs for chief executives are widespread in the oil industry, although they are not so numerous as in industry generally.

Of the 35 oil companies analyzed, 29 provided pensions, or 83% of the total compared with the 1960 industry average of 87%. The tobacco, electrical equipment, and railroad industries had 100% pension coverage. However, petroleum chief executives fared better than average on pension sizes. Pensions averaged 30% of their 1960 salary compared to 26% for all of industry.

Petroleum directors showed a marked inclination toward deferred compensation as a supplement to pensions, or even as a substitute. Eight of the 35 companies, or 34%, arranged for deferred compensation against a 24% industry average.

Executive turnover . . . The chief-executive turnover in 1960 was at about the same rate in petroleum as in industry at large (9% vs. 10%).

The three new chief executives (in Honolulu Oil, Standard of Indiana, and Standard of New Jersey), were paid at 92% of their predecessors' compensation, almost identical to the 91% industry figure.

In all industry, 85% of the new chief executives came from within the company. This was true of all of the new heads of oil companies, which over the years have preferred to groom their own top men.

DX's "New Look" Paying Off

• Company's circle station in Tulsa has proved so successful the design will be used in other cities.

DX SUNRAY Oil Co. plans to build more circle stations in other cities in its marketing area.

N. B. Ingram, vice president for retail marketing, makes this clear in reporting on the success achieved in 6 months by the first experimental circle station in Tulsa.

"We're extremely pleased with the circle concept of design," Ingram said. "We think it offers a practical solution to one big station problem—and that's traffic. We'll build some more this year, but we can't at this time disclose the location or number."

Features of the DX station—besides the unusual circle design—are an air-conditioned TV lounge, built-in driveway vacuum cleaners, gold-plated pump nozzles, wash and lube bays in the rear, and driveway hostesses (OGJ, Dec. 19, 1960, p. 52).

The hostess idea has been so well received by the public that DX has employed a second girl, making hostess service available from 8 a.m. to 9 p.m. daily. The hostesses not only serve as greeters—they give the woman's touch to merchandising in the sales-room area, and help in special station promotions.

Ingram's rundown on station sales performance:

... **Gallonage**—no exact figures released, but each month has shown an increase over the previous month and total gallonage has far exceeded sales forecasts. Ratio of premium DX Boron to regular also has increased each month, and in June the ratio was 56% Boron to 44% regular.

... **TBA ratio** is considered good, averaging about $63 per 1,000 gal. of gasoline per month during the first 6 months.

... **Motor tune-up** business is profitable, with each month's business showing a definite increase.

The DX-salaried personnel at the circle station have undertaken an interesting series of promotions in behalf of the station. Apparently these are building good will and business as well. They include:

... **Giving each new patient** at nearby St. Francis Hospital a rosebud vase with a fresh flower in it.

... **Extensive door-to-door solicitation** program covering every home in the station's territory.

... **Credit-card program** in which every qualified person in the neighborhood who didn't hold a DX credit card was issued one, with station personnel delivering it in person. A complete list of credit-card holders in the neighborhood has been compiled and used in a follow-up program involving personal sales calls, telephone solicitation, and direct-mail advertising.

... **Windshields** of all cars parked at a nearby bowling alley are cleaned and a DX circle card placed under the wiper blades. This has been used in conjunction with a tire-spotting program.

... **Special tire promotions** for three days in June produced good business. Free drinks, balloons, and lollipops for children and a special registration for a set of tires and free AAA memberships backed up the tire special.

... **A marine blending pump** was installed to attract the fast-growing boating trade. The station is located en route to Oklahoma's eastern lakes. The pump's location off the main driveways allows boating enthusiasts to get service without blocking other drives.

Ingram says the station design has proved popular with customers and with operating personnel. Heavy traffic in the bays has caused no problems on the driveways. Ingram also says the circle design is extremely flexible and can be used with no bays, one bay, two bays or more.

He adds that DX personnel currently are screening locations over the company's 18-state marketing area, and work on other circle stations will start soon.

Pure Kicking Off Its First Wildcat On Alaska Peninsula

PURE Oil Co. is preparing to spud its first wildcat in Alaska.

The company's first test in the state will be the 1 Canoe Bay, which will be drilled on the southern part of the Alaska Peninsula. Reading and Bates, Inc., Tulsa, has the contract for the well in Sec. 8-54s-78w.

Several wildcats have been drilled on the peninsula, but no commercial production has been found. One of the hot spots in Alaska's wildcatting campaign a couple of years ago was about 250 miles northeast of Pure's acreage. Mobil Oil Co. and Humble Oil & Refining Co. both drilled dry holes in this part of the peninsula.

Richfield Oil Corp. also is expected to start another drilling program soon, this time in the Katalla area. Richfield has spotted a location for its 1 Berling River in Sec. 32-18s-7e. The location is about 10 miles northeast of the old Ka-

talla field, which produced 150,000 bbl. of oil from several shallow wells before being abandoned in 1933.

Sinclair Oil and BP Exploration (Alaska) Inc., are partners in the Katalla venture.

Two other wildcats recently were spudded in Alaska. Richfield is drilling below 3,070 ft. at its 1 White River in the Yakataga area, and Standard Oil Co. of California is below 1,427 ft. at its Chaix Hills wildcat in the Icy Bay area.

Texaco Plans Loop in Alberta to Raise Its Gas-Liquids Capacity

TEXACO Exploration Co. is getting ready to expand its Alberta pipeline system to handle more natural-gas liquids.

The company plans 22.2 miles of 8⅝-in. loop for its Rimbey-Westerose section. Westerose connects with Texaco's existing crude system that goes to Edmonton. The loop will have capacity to Edmonton of 25,000 bbl. of condensate per day with no booster stations required.

In an application to the Alberta Oil & Gas Conservation Board, Texaco said it needs the loop for more effective transportation of condensate being received at the Homeglen-Rimbey gas plant and to transport products from Rimbey pump station.

The board will hear the application September 15.

On the same date, the board will consider Shell Oil Co. of Canada's application for a license to export 260,000 bbl. of butane through Texaco and Trans-Mountain Oil Pipe Line facilities to Shell's plant in Anacortes, Wash. Shell wants the permit for October 1, 1961, through September 30, 1962.

Texaco has a similar application which will be heard September 19 by the National Energy Board in Ottawa. Texaco wants to use Trans Mountain facilities to export 432,360 bbl. of butane to its Anacortes refinery between now and September 1962.

Texaco says that until butane and propane shipments reach a volume that would justify a separate LPG line, the company will continue its present policy of batching with crude in the existing system.

Watching WASHINGTON

Clyde La Motte

• Oil industry survives another session of Congress . . .

CONGRESS is about ready to quit and go home. Some oil-related legislation will be acted on in the closing rush, including Senate approval of a fuels study, but little else of major oil importance remains.

President Kennedy's proposed tax revisions have fallen by the wayside. You will recall that he had suggested temporary steps to be taken this year as a prelude to a major overhaul of the tax system next year.

The short shrift given to his interim recommendations makes one wonder how much success the administration will have with a big tax revision program during the next session of Congress.

Old-timers in Washington are skeptical. They know that it is extremely difficult to "undo" an established practice. They point to the many "temporary" tax changes made a war or two ago that are still with us. And whether a tax regulation is good or bad, once it becomes a part of the woof and weave of a tax pattern, it is hard to change without destroying the entire fabric.

The outlook, therefore, is this: Unless there is some extreme emergency, such as a shooting war, the administration is going to have a very rough time next year in getting substantial changes made in the tax program.

• Congressional action seldom hurts oil much, but . . .

FOR THE MOST PART, there has been relatively little congressional action in recent years that has had a major impact on the oil industry.

The real impact on oil has been through administrative action and court rulings.

The oil-import-control program, for example, was set up through a presidential proclamation. Regulation of natural-gas producers started with a ruling by the U. S. Supreme Court in 1954.

Justice Department action can have more direct effect on a merging company than any bill pending before Congress now. And crackdowns on marketing practices by Justice or the Federal Trade Commission can make a great deal of difference at an oil company's cash register.

Of course the industry must continue to keep abreast of the doings of Congress. But it should not lose sight of developments in the myriad of governmental agencies.

Too, Congress does quit and go home from time to time, but the governmental agencies never close shop. Keeping watch on the Potomac is therefore a year-around chore for the industry.

• Some examples of what is just around the corner . . .

EVEN with Congress quitting soon, some key oil-related government decisions will be drafted in Washington during the next month or two.

For instance: Interior Department will make up its mind on changes in the oil-import-control regulations. Internal Revenue Service will decide what further restriction, if any, to place on ABC deals.

The Federal Power Commission will have to shape policy on area-pricing and other important regulatory issues. OCDM will determine whether to recommend to the White House that controls on residual fuel-oil imports be ended or continued.

So it's all right to sigh with relief when Congress adjourns, but continue to keep an alert eye on Washington.

Ohio Oil Flexes for Marketing Battle

W. A. Bachman
Marketing Editor

THE oil giants, fighting to stake out claims in the upper Middle West in their search for national markets, had best keep an eye on some "country boys just recently come to town."

Ohio Oil Co. has moved itself into a strong position to give the newcomers and the old hands alike some real competition.

Ohio's Marathon products long have been entrenched in rural and small-town areas of Ohio, Indiana, Illinois, Wisconsin, Michigan, and Kentucky. Now they are making strong bids for customer favor in the metropolitan regions.

The Ohio move into Chicago, Cincinnati, Akron, Louisville, Milwaukee, and Cleveland actually started several years ago, although it is just becoming evident.

Behind the marketing move is a strategy of balanced growth based solidly on the company's own facilities in production, refining, and distribution.

This is obvious when these statistics are considered:

Ohio crude and gas-liquids production of 110,000 bbl. daily last year, and its refinery crude throughput of 100,000 bbl. daily, nearly achieved that balance which is the goal of every integrated oil company.

This spread was purposely widened in the first half of 1961 because of market conditions. Refinery runs were cut back 9% to about 91,000 bbl. daily while liquids production rose to 118,600 bbl. daily. Even these shifts emphasize that the company holds an enviable production-refining position.

Ohio's three refineries are well located within its marketing area, at Robinson, Ill., and at Muskegon and Detroit in Michigan. Product pipelines and terminals now in operation or being built will tie these plants neatly into the company's expanding metropolitan markets.

The strategy . . . Ohio plans to remain a regional marketer.

Marketing Vice President Grant Young makes this pretty clear. He views the company's present six-state territory as one of the best by both population and industrial standards, with an excellent potential for growth. He thinks it's smart to cultivate this area intensively, grow with it, and let any expansion take place on the fringes.

Other concepts in Ohio's plan:

. . . **Buy existing marketers** where possible to avoid diluting the market by overcrowding.

. . . **Build new outlets** where necessary and constantly upgrade existing ones with potential or eliminate those that are marginal.

. . . **Maintain all-season sales** balance by expanding fuel-oil volumes along with gasoline.

. . . **Move into petrochemicals** for added profitability to present processing and distribution facilities.

On the move . . . The new era in Ohio marketing actually started in August 1959 with acquisition of Aurora Gasoline Co. and its Speedway 79 sales organization.

Aurora had 680 Speedway service stations—400 of them in metropolitan Detroit, 250 more in Michigan. It had refineries at Detroit and Muskegon and was an important supplier of home heating oil, industrial fuels, and asphalts over an area extending into Wisconsin and Canada.

Aurora's marketing territory was immediately adjacent to Ohio's and fit nicely into the expansion pattern. The Aurora refineries also allowed Ohio to use increasing volumes of its own crude production in southern Michigan.

MARATHON "show case" stations like this are popping up as Ohio Oil expands into upper Middle West cities.

in Big Cities

Grant H. Young
Ohio's marketing chief
. . . stresses regional concept.

Other purchases also have extended and consolidated Ohio's territory.

Prior to the Aurora deal, Ohio had moved deeper into Kentucky with acquisition of an established Bowling Green marketer. It bought a chain of stations in Cincinnati and acquired several by purchase in the Chicago area. Early this year it added the Ross chain with 92 stations in Akron environs. And only last month Ohio purchased Petroleum Terminals, Chicago wholesaler of gasoline and fuel oil in Illinois, Indiana, Wisconsin, and Michigan.

Ohio also is pursuing a steady pace in a long-range campaign to place new service stations in expanding suburbs and along new traffic ways, or to face lift stations in older neighborhoods.

In 1958, some 32 new Marathon stations were built. Sixty more were added in 1959, and 107 in 1960. The program is being maintained at the same pace this year, with total retail outlets well past 3,700.

Supporting this expansion move into metropolitan centers is a network of product pipelines and terminals linking Ohio refineries with the markets.

The 50,000-bbl.-daily Robinson, Ill., plant is now connected by the Wabash Pipeline to terminals at Champaign, Ill., and Griffith, Ind., near Chicago. Ohio's Griffith terminal is connected by laterals to terminals at Niles, Mich., and Lake Calumet and Des Plaines, Ill., all in the Chicago area. The West Shore Pipe Line, now being built, will connect Ohio's Chicago area terminals with Milwaukee and Green Bay, Wis. On the eastern shore of Lake Michigan, Ohio has the 16,000-bbl.-daily refinery at Muskegon, Mich., to serve central Michigan and other lake points.

The Robinson plant and the 47,000-bbl.-daily Detroit refinery lie at opposite ends of a pipeline system that serves terminals in Illinois, Indiana, Ohio, and Michigan. The newest terminal is at Brecksville, which allows Ohio entrance into the heavily populated Cleveland-Akron-Youngstown area.

The pipeline-terminal network also gives Ohio the advantage of being able to move its own products by comparatively short haul. This is important in competing in markets with other such refiners as American, Ashland, Gulf, Pure, Sun, Mobil, Cities Service, Sinclair, Shell, Texaco, and Sohio, plus several independent refiners and two marketing newcomers in the area—Humble and Phillips.

Balance . . . Ohio in its expansion is aiming at balanced sales in all seasons.

For example, in 1958 Ohio's total sales of refined products were 42,668 bbl. daily. Of this 26,887 bbl. daily was in gasoline and 12,315 was in middle distillates. By 1960, total sales reached 97,228 bbl. daily—51,040 bbl. daily in gasoline and 28,994 in middle distillates. The sales of both middle distillates and heavy oils showed a larger percentage growth than gasoline.

In addition, Ohio has plans to enter petrochemicals in 1962. It has a contract to deliver Dow Chemical Co. a stream of benzene-toluene mix from the Detroit and Robinson refineries. This will be only a beginning. The Ohio research center near Denver is starting a research program into petrochemicals and may point the way for other ventures.

Whatever direction Ohio's expansion takes, it will be bolstered by a strong financial position. The company has nearly $36 million in cash and short-term securities and a long-term debt of only $6 million. For several years prior to 1959 the company had no long-term debt. Its current cash condition puts it in excellent position to expand by either purchase of construction.

Up to this point, Ohio's expansion into the larger cities has not been helter-skelter. The moves have rather been sound and steady. Marketing Vice President Young and his staff are anxious for expansion moves to be profitable.

The station-building program so far has emphasized "show-case" stations which give an excellent image of the company and its Marathon brand. Satellite stations may follow.

Ohio marketers also are working on a new trademark to blazon the "Big M" into better recognition. Several have been tried, and a selection is expected this year. And under discussion is a possible move to change the company name—perhaps to Marathon Oil Co.—to align the company closer to its product brand name.

There's also a feeling at Ohio's general offices in Findlay that the company may be in foreign marketing before too long. Ohio will build a refinery in Spain, in conjunction with the Spanish oil agency soon.

That $5 Right-of-way Charge is Out

INTERIOR Department has withdrawn its proposed $5-an-acre minimum charge of right of way across public lands. Instead, it will charge a fair market value as determined by Bureau of Land Management appraisal.

In June, Interior issued a proposed regulation specifying the $5 minimum. Considerable objection was voiced, particularly by oil-and-gas pipeline people, who said such a proposal had no relationship to a fair cost. Also, they noted, it would greatly increase their right-of-way costs in many instances.

Interior officials decided there was merit in these objections. So it eliminated the minimum charges from the final draft.

The regulation also provides for periodic reappraisals in order to keep charges in line with changing land values.

East Texas Crude May Firm Up at $3.10 Level

• Most crude is now moving at that price. Only a few big buyers are still sticking to $3.25 per barrel.

IT BEGINS to appear more and more likely that the crude-price picture in East Texas field is going to come into focus eventually at about $3.10 per barrel.

Purchasers of more than 50% of the giant pool's current production of 125,000 bbl. daily now have cut from the former flat $3.25 per barrel.

Nine companies are posting below this price—and seven of them are grouped at the $3.10 level.

Latest to pare their East Texas prices are: Mobil Oil Co., Sun Oil Co., General American Pipeline Co., and Panola Co. All dropped their prices 15 cents a barrel to $3.10.

They joined Sinclair Crude Oil Co., Tidewater Oil Co., and La Gloria Oil & Gas Co. in this group. Sinclair first posted the $3.10 price in April 1960. Tidewater followed in April of this year and La Gloria a month later.

Atlantic Refining Co. has been paying only $3.05 a barrel since July 1959. And Premier Oil Refining Co. cut to $3.15 in April 1960.

Not yet heard from are such major crude buyers as Humble Oil & Refining Co., Shell Oil Co., Texaco Inc., and Indiana Oil Purchasing Co. They are still posting at the $3.25 level.

Effect of cuts . . . The latest East Texas cuts affect purchases totaling nearly 40,000 bbl. daily.

General American Pipeline's cut affects 15,000 bbl. daily; Mobil's, 11,300 bbl. daily; Sun's, 10,000 bbl. daily; and Panola's, 3,000 bbl. daily.

They bring to nearly 80,000 bbl. daily the amount of East Texas oil now going below the $3.25 top. The bulk of this, though not all, is East Texas field crude.

In all cases, price-cutting buyers said the new lower prices reflect the present value of East Texas crude to them as compared with other available Texas crudes.

Many in the industry contend that East Texas oil, by retaining its $3.25 price so long while other Texas crudes were dropping, has priced itself out of the big market as a cracking stock for light products.

Meanwhile, West Texas sour and intermediate crudes have waxed highly popular due to their much lower price.

Cuts draw blasts . . . The rash of downward adjustments in East Texas, New Mexico, and on the Gulf Coast has brought criticism from independent producers.

One operator estimates the new East Texas cuts alone will cost producers there more than $2,160,000 annually.

And in Austin, the Texas Independent Producers and Royalty Owners Association has said it will appeal to all price-cutting purchasers to rescind the cuts.

J. F. West, TIPRO president, says purchasers should be raising in West Texas rather than cutting in East Texas.

More cuts . . . While East Texas cuts have stolen most of the publicity, there have been others.

Continental Oil Co. has shaved the prices it pays for crude in Chaves, Eddy, and Lea counties, New Mexico, from as little as 6 cents up to 13 cents a barrel.

Its new posting is $2.95 a barrel for 40° to 44.9°-gravity oil with a 3-cent differential downward for each degree gravity to 20° gravity. For 20°-gravity oil this is a cut of 26 cents a barrel.

Meanwhile, on the Texas Gulf Coast, Plymouth Oil Co. has lowered its price for 40°-44.9°-gravity crude by 5 cents a barrel. Its new top posting is $3.25 with a 2-cent differential downward and upward for each degree gravity change.

Processing Briefs . . .

New refinery at Wolf Point, Mont., is being placed on stream this month by Petrofuel Refining. The plant has a 6-month contract to supply 5 million barrels of jet fuel to the Glasgow, Mont., Air Force base. Shipments will begin October 1. Capacity of the new refinery is 3,000 bbl. daily. Petrofuel officers are Mel Hanlon, Billings, president; A. W. Eynon, Wolf Point, vice president; and William Hanlon, general manager. David Fraker is manager of the new refinery.

Bowie Gasoline Co. has sold for $600,000, a natural-gasoline plant at Bowie, Tex., to Bowie Gasoline Corp., a newly formed company headquartered at Wichita Falls, Tex. The plant has a capacity of 26,000 M.c.f.d., but has only been handling about 5,000 M.c.f.d. in recent months. New owners plan to lay more lines to gather additional gas.

Kerr-McGee will discontinue the manufacture of gasoline and fuel oils at its Cushing refinery in October. Plans are to concentrate on making high-quality lubricating oils at this location. High crude costs, low spot market prices, and obsolete manufacturing facilities were blamed for the move.

Removal of zoning obstacles will permit Shell Oil Co. to proceed with plans for its first East Coast refinery to be located on Delaware Bay below Wilmington, Del. However, Shell reiterated last week that the proposed refinery and petrochemical plant, with initial investment of $80 million, is a long-range project.

Expansion of Tenneco's Leabo natural gas-processing plant in Palacios, Tex., is scheduled for completion in early fall. Capacity will be increased from 55,000 M.c.f.d. to 90,000 M.c.f.d. The deethanized product will be sent by pipeline to the company's plant at La Porte, Tex., for fractionation. All design, engineering, and construction, is being handled by O. L. Olsen Co. of Houston.

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Alaskan Leasing Changes Hit

- **State agency indicates it may require year's rental on non-competitive bids, but wants other changes.**

A PROPOSAL that "skid bidding" be adopted on competitive lease sales in Alaska was attacked at a recent public hearing in Anchorage.

Roscoe Bell, director of Alaska's Division of Lands, proposed skid bidding be adopted by the state in future competitive lease sales. Under this type of bidding, a bonus on one acreage can be moved or skidded to another if the bidder is unsuccessful on the first acreage.

For example, an operator could bid $1,000 on a parcel with the stipulation that if it is an unsuccessful bid, the $1,000 can be applied to a second parcel. If the bonus on the second parcel is $1,000 and the first bid unsuccessful, then the $1,000 skidded from the first parcel brings the second parcel's bonus up to $2,000.

It is possible to work many combinations with skid bidding.

Say that an operator has made 10 bids of $1,000. If the first nine are unsuccessful, then they can be pyramided to a bonus of $10,000 on the tenth tract.

Or, short skids are possible. An operator might want to skid four bids, reaching a total of $5,000 on a fifth tract—then skid four more to make $5,000 on another. In both examples, only $10,000 in bonus money is involved.

Several oil men attending the Anchorage meeting protested the proposal and requested a public hearing on the issue. A hearing is planned, but no date has been set.

Skid bidding is used in Canada on large blocks of crown acreage, but some of those attending the Anchorage hearing said it would complicate leasing in Alaska.

Non-competitive leasing . . . The Anchorage hearing was held to discuss non-competitive leasing procedures in Alaska.

Non-competitive leasing on wildcat acreage in the state is being backed by Western Oil & Gas Association, but the group wants advance payment of the first year's rental adopted as part of the leasing procedure.

G. Y. Wheatley, Superior Oil Co.'s Alaskan manager and chairman of WOGA's Alaskan committee, cited recent leasing in the Tyonek area as an example of the pitfalls of not requiring a year's rental on non-competitive acreage.

Wheatley said 13,382 applications were filed for 82 tracts. Only four "bonafide" operators won tracts while 95% of the acreage went to non-operators who now are attempting to sell the leases to oil companies "at unreasonably high prices." Wheatley pointed out it took only a $20 filing fee to be eligible for a non-competitive lease.

The WOGA spokesman said non-competitive leasing is needed in Alaska to attract wildcat money, but urged the state to require the advance rental payment to discourage promoters.

The state has indicated it will require the advance rental payments, but has not announced its intentions.

Two Journal Veterans Die

J. Parker Holland, 54, production manager of The Oil and Gas Journal for many years and more recently an assistant vice president, died September 2 of a heart attack. He had been with the Journal since 1943.

James C. (Jack) Holtzclaw, 58, night pressroom foreman, died September 3 of complications following surgery. He had been with the Journal 35 years.

Pipeline Briefs . . .

Contracts for three Dixie LPG Pipeline river crossings have been awarded. Pentzien, Inc., is laying 3 miles of line across the Mississippi River north of Baton Rouge, La. Houston Contracting Co. will handle the 1,200-ft. crossing on Atchafalaya Bayou near Krotz Springs, La., and Sharman, Allen, Gay & Taylor, Inc., will lay the 600-ft. crossing on Tombigbee River near Demopolis, Ala. The 1,077-mile Dixie line will extend from Mont Belvieu, Tex., to Cary, N. C.

First butane shipment through Mid-America Pipeline's LPG system arrived July 31 at Skellytown, Tex., terminal. The system has been running propane since it started operations late last year. The company's quarterly report to stockholders say 25 shippers are using the system and that propane shipments reached 27,000 bbl. a day during July.

A 26-in. submarine line to move crude from tankers will be built at Standard of California's El Segundo, Calif., refinery. The line will have a capacity to handle 25,000 bbl. hourly, raising the refinery's tanker discharging capacity to 45,000 bbl. hourly. Two submarine lines are in service. The $2-million expansion at the refinery includes a 323,000-bbl. tank and a 1,400-hp. pump station. Healy-Tibbitts Construction Co. is scheduled to complete the line by January.

The 138-mile expansion program of Natural Gas Pipeline Co. of America will be handled by R. H. Fulton & Co. It consists of 75 miles of 30-in. in Illinois, 42 miles of 36-in. in Kansas, including a river crossing, and 21 miles of 30-in. in Iowa.

The Nooksack River crossing in Whatcom County, Washington, for El Paso Natural Gas has been contracted to Mid-Mountain Contractors, Inc. It will consist of 2,200 ft. of 26-in. line.

Contract for 52 miles of 8, 16, and 20-in. pipelines from Lake Palourde to Bay Round in Louisiana has been awarded Houston Contracting Co. by Texas Gas Transmission.

Contract to lay 24 miles of 26-in. line near Cleveland has been awarded to H. L. Gentry Construction Co. by East Ohio Gas. Work has started with Gentry headquarters in Perrysburg, Ohio.

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New Services Report Drilling-Deal Offers

● Three reporting services are operating and a fourth is planned. Biggest problem: Some oil companies think advertising cheapens their properties.

A NEW kind of "clearing house" for drilling and lease deals has sprung into existence this year in three cities of the oil country.

Each is a separate enterprise, but all have the same basic format: A periodic report to subscribers and other parties on farmouts, drilling proposals, and leases for sale.

Houston, Casper, and Tulsa are the home bases of the three reports. New Orleans may have one by the end of the year. An effort to start one with a different twist at Midland failed.

Proprietors of the reporting systems believe they can offer much wider and faster circulation of drilling propositions to interested parties than the traditional method of company-to-company or broker-to-company contacts.

The Houston, Casper, and Tulsa operations have yet to prove themselves. All have struggled for a place in the industry, and none can yet be considered an unqualified financial success. It may take a year or 2 to show whether they are here to stay.

The companies . . . The three companies are generally regional, although their mailing lists may cover the country.

. . . In Houston, the Farmout and Lease Listing Service (FALLS) distributes the FALLS Report initially to a dozen subscribers in Texas and Louisiana and later to another 165 companies and individuals. Owner W. E. Failing doubles as broker for the nonsubscribers but hopes the brokerage business dwindles as the subscribers increase.

. . . In Casper, the Farmout Report covers the Rocky Mountain region for 48 subscribers. Another 200 companies get the report later on a sample basis. Carl E. Jenkins is the manager. Barlow & Haun, geologists in Casper, are associated with the business.

. . . In Tulsa, the Farmout Review covers Oklahoma, Kansas, North Texas and western Arkansas for an unannounced number of subscribers and a free list of some 320. Owner Peter Verhalen expects to do away with the free list when he has 100 subscribers.

. . . In New Orleans, Dr. William L. Blackman, an economics professor at Louisiana State University, is contacting oil companies through Rondin Associates and plans to establish an "exclusive" reporting service to some 50 subscribers.

. . . In Midland, the Chalfant-Magee organization tried last spring to line up a reporting and brokerage service on leases being dropped but failed to get the support it needed from the majors.

What they offer . . . The three companies now in operation publish, usually monthly, a set of drilling and lease deals.

Each deal is allotted one 8½ by 11-inch page, and space is provided for platting the acreage. Those making the offer are encouraged to give as much information on the proposal as possible.

Usually the companies will accept listings from any responsible party but vary as to the fees, if any, charged.

The FALLS Report in Houston goes to the subscribers at least 2 weeks before the general mailing. Names of companies making the offers are withheld, and contact must be made through FALLS, which then acts as broker for nonsubscribers.

In practice, FALLS sends its new listings immediately to subscribers, rather than wait for them to accumulate, but sends to nonsubscribers monthly.

The Farmout Report at Casper gives subscribers a 2-week edge over others but does not seek to act as broker in deals. Companies making the offers are listed on the report forms, and contacts are made directly.

Farmout Review at Tulsa will not broker any deals and ordinarily allows only subscribers to list properties in the report. The mailing goes to both subscribers and the free list simultaneously.

Owner Verhalen has found that while smaller companies are more apt to become subscribers, the majors deal most on properties.

The cost . . . Subscription rates for the three services are in the neighborhood of $1 per day.

The Houston service is $384 per year, or $201 for 6 months. Casper charges $27.50 per month, or $15 for the northern or southern Rocky Mountain editions separately. Tulsa gets $360 per year, or $90 for a 3-month introductory period.

Houston and Tulsa make no charge to the companies which list properties in the report. Casper charges nothing except for a $6.50 fee for offers of acreage for sale.

The New Orleans company expects to charge a much smaller subscription fee but will require payment of a flat fee to the service for each deal consumated.

The results . . . The services have not operated long enough to prove conclusively that they can bring off a large number of deals that otherwise would not be made.

But Bill Failing said in Houston

INDUSTRY

Liquidation of Blackwell Oil & Gas Co., Tulsa, has been approved by stockholders. The firm's producing properties, leases, and other assets will be sold to Calvert Exploration Co., Tulsa, and Mid-America Minerals, Inc., Oklahoma City, for $4,750,000.

Plans to buy all capital stock of Davidson Drilling Co., Fort Worth and Midland, Tex., were announced by Pure Oil Co. Davidson will get an undisclosed amount of cash and deferred payments from production. Pure gets about 550 bbl. daily of oil production from North and West Texas leases, plus substantial nonproducing acreage.

Reorganization of Atlantic Refining Co. has been completed well ahead of schedule. Announced in

last week he can count some 20 that have occurred since he began operations last spring.

At Casper, Jenkins does not have the close check on completed deals that the Houston company enjoys because contacts are made directly between buyer and seller. But he has confirmed seven completed deals during the first 3 months after starting business last December.

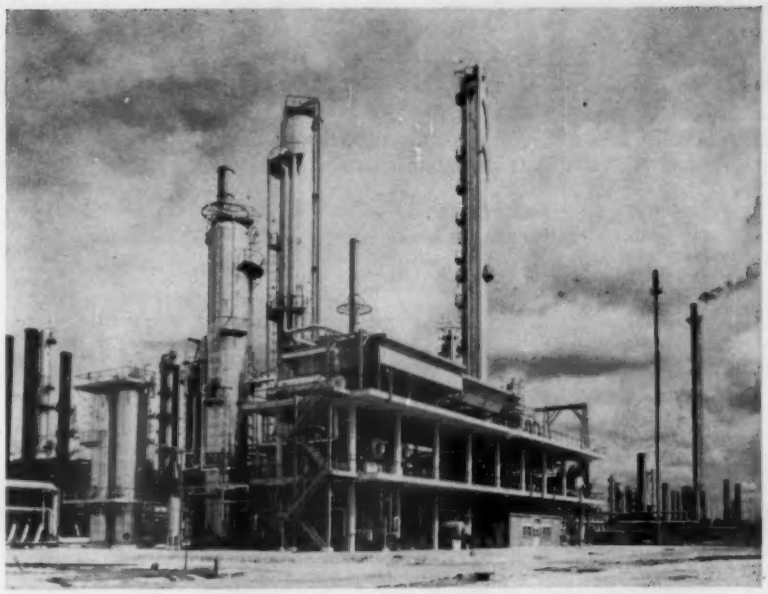
Verhalen at Tulsa says the first three issues of his report have averaged 30 listings each and that deals were consummated on 18% of them in May, 24% in June, and 30% in July.

The problems . . . The fact that subscribers have been difficult to come by has surprised, and disappointed, the operators of the new report services.

The manager of one complains that the majors are always slow to change their methods of doing business; they fear their properties are cheapened by advertising—even though the advertising goes to a limited clientele.

Eventually the reporting services expect to overcome the reticence of the industry.

They contend that the wide distribution they can offer to potential buyers and drillers will save manpower and field expense and bring off deals that otherwise would go unnoticed.



New Petrochemical Unit Goes on Stream

ONE new petrochemical unit has been completed by Cities Service Co. at Lake Charles, La., and another will be built at the company's East Chicago, Ind., refinery.

The plant which has just been put on stream (photo) will make 120,000 lb. per year of orthoxylene, a raw material for making phthalic anhydride. This material is converted into synthetic resins, plasticizers, pharmaceuticals, and dyes.

The new unit will be the first in the Midwest to produce high-purity petroleum naphthalene. The plant, with initial design capacity of 50,000,000 lb. per year, will be completed in mid-1962.

The Cities Service naphthalene plant is the second to be announced in as many weeks. Texaco Inc. will build one of 100,000,000 lb. capacity at Port Arthur, Tex., to go on stream by the beginning of 1963.

BRIEFS . . .

April, the program stressed decentralization (OGJ, April 17, p. 84). Atlantic created more district offices, each with its own manager, in order to put decision making closer to the work.

Proposed merger of West Canadian Oil & Gas, Ltd., and Canadian Delhi Oil, Ltd., will be considered by stockholders of both firms at meetings to be held around December 1. Canadian Delhi would be the surviving company, and each West Canadian shareholder would get one share of Canadian Delhi for every 3¾ shares of West Canadian.

Interest in 41 wells in Buckshot field, Cochran County, Texas, has been sold by J. W. Murchison and Meredith Mallory, Jr., to Atlantic Refining. The deal includes full working interest through the San Andres formation under 1,040 acres on which 26 wells are located, plus 18.5% interest in another 617 acres and 15 wells. Atlantic is considering a secondary recovery program in the area.

Crude storage facilities will be built by Socony Mobil on Terminal Island outside Los Angeles. The tanks eventually will be connected by pipelines to a tanker terminal in the outer harbor of Los Angeles.

One-cent tax hike passed by Washington Legislature accounted for a 15% boost in state revenue during August. Motor vehicle fuel tax collections rose 21.7% during the month.

Merger of Grande Corp. into Magna Oil Corp. of Houston was completed last week. Magna issued 1,914,255 shares of new stock for Grande's outstanding stock. Exchange was at the rate of 0.99 of a share of Magna for each Grande share.

Patent dispute between Du Pont and Phillips Petroleum has been settled outside court. Du Pont is dismissing a suit filed in 1958 over composition of matter patent on high-density polyethylene. Settlement involves an exchange of patent rights.

Gibraltar Oil Corp., Dallas, has sold eight oil wells producing from the San Andres in Penwell field of Ector County, West Texas, to Mallard Petroleum, Inc., Midland, and Stanton Oil Co., San Antonio. Purchase price for the 160-acre lease was not disclosed.

How Southwestern Refinery Runs Shaped Up in July

HERE are figures on crude runs in southwestern states where data is available from state regulatory agencies.

Arkansas

(Refinery Runs in Barrels Daily)

Company and location—	July	June	July 1960
American, El Dorado	37,118	40,844	37,118
Lion, El Dorado	35,069	34,705	34,623
MacMillan, Norphlet	3,676	3,679	2,521
Other	5,429	6,130	6,239
Total Arkansas	81,292	85,358	80,501

Louisiana

Cities Service, Lake Charles	168,077	159,708	166,737
Continental, Lake Charles	49,954	49,746	38,455
Humble, Baton Rouge	296,760	313,582	306,350
Ingram, Meraux	18,741	19,053	17,235
Shell, Norco	107,416	106,876	106,802
Tenneco, Chalmette	48,057	46,020	30,858
Other	6,770	7,734	7,835
Total Louisiana	695,775	702,719	674,272

Mississippi

Paluxy, Yazoo City	1,760	1,669	1,412
Pontiac, Hattiesburg	16,036	14,835	17,394
Southland, Sandersville	5,736	5,608	6,355
Total Mississippi	23,532	22,112	25,161

Texas

American, Texas City	102,258	114,313	144,116
Am. Petrofina:			
Mt. Pleasant	17,225	16,074	15,385
Wichita Falls	9,552	8,238	5,756
Atlantic, Port Arthur	65,519	26,372	65,199
Col-Tex, Colorado City	8,459	7,514	9,219
Continental, Wichita Falls	13,496	13,314	12,149
Cosden, Big Spring	28,129	25,267	30,713
Crown Cent., Houston	34,933	34,603	35,117
Delhi-Taylor:			
Corpus Christi	42,486	39,956	33,962
Port Isabel	5,769	5,393	5,753
Eddy, Houston	2,101	2,149	2,046
El Paso, Odessa	12,792	13,362	13,679
Gulf, Port Arthur	240,093	226,895	266,171
Howell, San Antonio	2,348	2,727	2,387
Humble, Baytown	270,924	256,568	270,885
La Gloria, Tyler	16,907	16,892	15,599
Mobil, Beaumont	200,456	215,084	204,975
Phillips:			
Phillips	71,222	71,976	62,290
Sweeny	66,454	63,598	57,904
Plymouth, Texas City	36,391	35,144	23,700
Pontiac, Corpus Christi	49,747	48,155	44,556
Premier:			
Fort Worth	7,260	7,381	7,387
Longview	3,155	3,125	3,331
Pure, Nederland	75,251	69,787	83,494
Shamrock, Sunray	25,164	25,000	24,713
Shell, Houston	122,621	119,926	108,670
Signal, Houston	57,481	54,978	52,044
Sinclair:			
Corpus Christi	21,569	14,580	27,994
Houston	72,770	78,321	129,954
Skelly, Longview	2,106	3,686	1,563
Southwestern, Corpus Christi	24,390	37,127	35,453
Stand. Texas, El Paso	50,369	50,291	51,452
Suntide, Corpus Christi	38,264	36,925	39,920
Texaco:			
Amarillo	16,332	17,008	17,677
El Paso	11,558	12,071	13,542
Port Arthur	273,903	227,158	288,239
Port Neches	42,490	42,245	39,771
Texas City, Texas City	34,546	31,695	32,404
Other	21,634	21,469	21,699
Total Texas	2,198,124	2,096,367	2,291,374

640-Acre Spacing Due Soon

. . . in new Elk Horn Ranch field of North Dakota. State regulatory group initiated action soon after discovery.

NORTH Dakota's first 640-acre spacing order is expected soon.

It will affect the 9-section 5,760-acre Elk Horn Ranch field in Billings County.

The state Industrial Commission's Oil and Gas Division initiated a spacing hearing for the field last month, and a temporary order has been drawn up but not filed.

Shell Oil Co. brought in the discovery well for initial flow of 136 bbl. daily of 43.5°-gravity crude in SW NE NE of Sec. 5-143n-101-2. Production is from the Devonian-Three Forks at 10,705-15 ft. and the Mississippian-Bakken at 10,682-92 ft. Total depth of the well was 13,081 ft.

Shell is the major leaseholder in the area with 2,560 acres. Other operators are Northern Pacific, C. Hunt, Texaco, Ashland Oil & Refining, Lauck Oil, and Colorado Oil & Gas.

The discovery is remote from other production. Rough Rider 9 miles north in McKenzie County is the closest field. Nearest oil to the south is Scoria field—24 miles away.

North Dakota has three fields under permanent or temporary orders for 320-acre spacing, 32 on 160 acres, 45 on 80 acres, and 6 on 40 acres.

In preparing the new temporary order, the commission said the wide spacing was being ordered:

"To drain efficiently the recoverable oil, to assure orderly and uniform development, to avoid the drilling of unnecessary wells, and to prevent waste in a manner that will protect correlative rights."

A second hearing will be held at the end of 18 months, at which time a permanent spacing order could be issued.

"Should additional information subsequently indicate the pool is not being efficiently and adequately drained on the 640-acre pattern," the order states, "additional wells may be drilled on another, uniform pattern."

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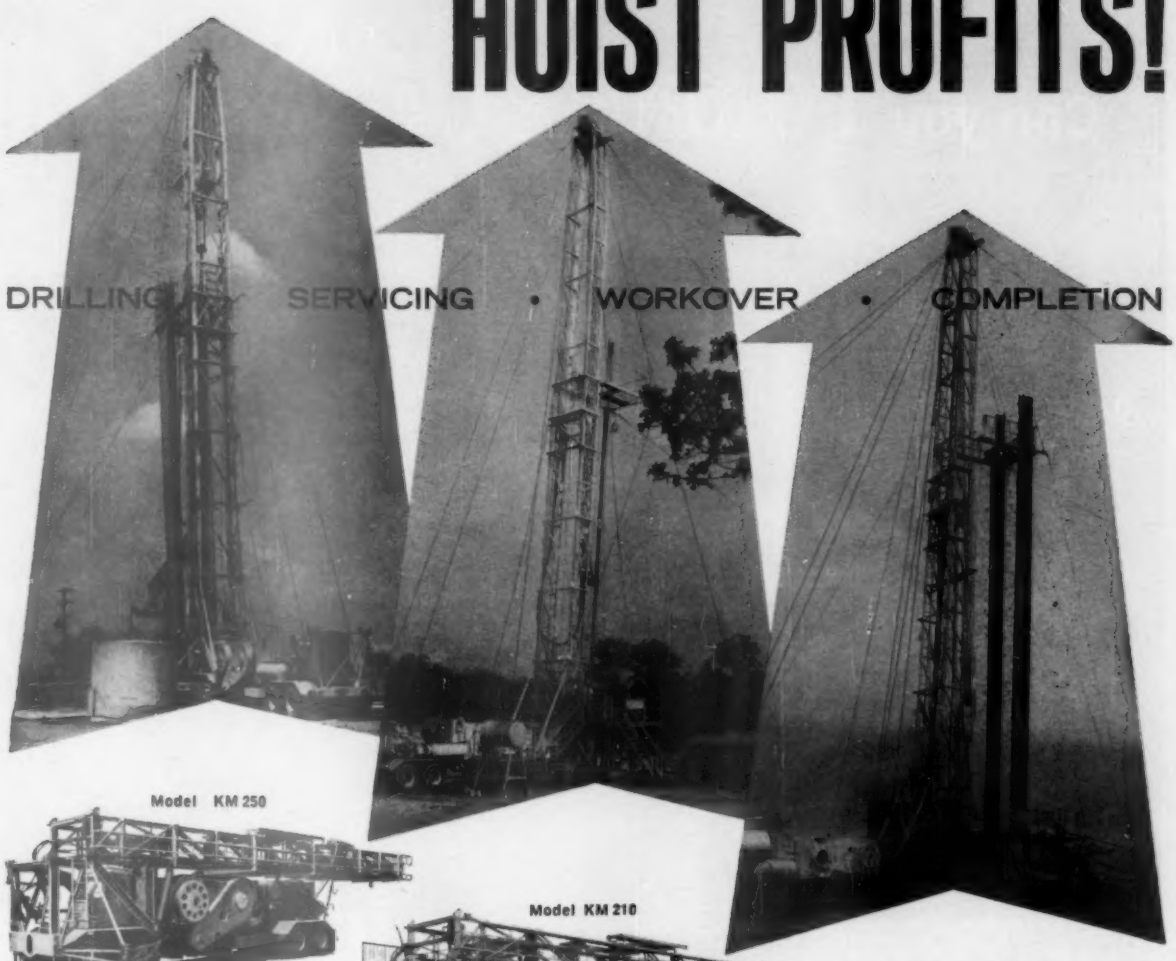
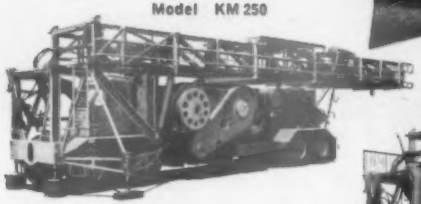
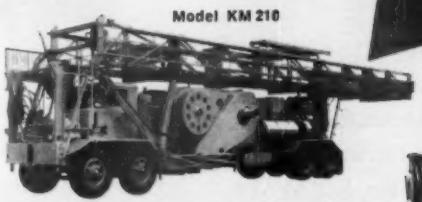


Model KM 250



Model KM 210



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The cylinder sleeves or liners shown here appear to be identical. Actually they are vastly different. One will last far longer than the other.

If you picked the one on the left to last longer, you're correct. It meets the hardness requirements that Mack engineers find necessary for maximum life. This means the sleeve is hard enough to provide many thousands of miles of trouble-free life . . . that piston ring and piston scuffing will be minimized. This sleeve is a genuine Mack part.

But the "will-fit" sleeve on the right could not even be measured on the same hardness scale as the Mack liner. It is too soft. Because it is softer . . . and because it is not impregnated with a surface lubricant as is the Mack sleeve . . . this liner will wear more rapidly. It is much more prone to ring and piston scuffing and premature failure. And the "will-fit" sleeve's life expectancy is naturally short.

Unless you can afford the expense of extensive laboratory and field tests, it's impossible to forecast the success or failure of a replacement part. You are far better off specifying genuine Mack parts. Only then can you be sure of preserving the quality you invested in originally. Sometimes you are actually improving performance since Mack is consistently improving its parts—original and replacement alike.

When it comes to service, you should make the same comparison. Mack-trained mechanics can make a big difference, too. Mack Trucks, Inc., Plainfield, New Jersey. Mack Trucks of Canada, Ltd., Toronto, Ontario. 8077

MACK FIRST NAME FOR **TRUCKS**

AVGAS and jet fuel from Standard of California's El Segundo refinery arrive at Los Angeles' new International Airport for storage and filtering, then . . .

PLANES take on fuel supply from a 29-mile hydrant system the company has built. Trucks are merely connection between the planes and system, serving to meter and filter fuel.

Pipelines Feed Planes at New LA Airport

A JET-AGE fueling system has gone on stream at Los Angeles' new International Airport.

The hydrant system is the first of three expected to be installed as airline service is switched from the adjacent old airport to the new one. Airport authorities have outlawed truck fueling at the new facility.

Standard Oil Co. of California is the first on stream with a hydrant system. The company supplies fuel to the new airport through three 4-in. lines running from its El Segundo refinery 3 miles away. The company has laid 29 miles of line at the airport, ranging in size from 4 to 18 in. It takes 500,000 gal. of fuel to fill the system.

The fuel moves from the refinery to a bulk station where future movement is controlled by an electronic system. The control system monitors line pressures, cuts pumps in and out to maintain line pressures and flow rates, and takes start and stop signals from the various planes being fueled. Similar systems are planned for other airports (OGJ, May 29, p. 103).

What is moving . . . Currently, Standard of Cal is pipelining two grades of avgas, 100/130 and 115/145, and No. 1 turbine fuel from the refinery to the airport. Later one of the 4-in. lines will handle JP 4, which now is being trucked along with two lower grades of avgas.

The bulk plant has underground storage for 830,000 gal. of fuel. The bulk of the storage, 585,000 gal., is for the turbine fuel.

The bulk plant is linked to the various loading ramps by a main pipeline system of three lines, 12, 14, and 18 in. in diameter. Each loading ramp is connected with the three big lines, then looped by a 12, 10, and 8-in. system. And each loading arm is served by 10, 8, and 6-in. lines running from the loop.

Fueling rates . . . The hydrant system is designed to handle a plane in about 15 minutes, even if it is a big jet taking on 18,000 to 20,000 gal. of fuel for an overseas flight.

The main pipeline system presently has a pumping capacity of 1,600 gal. a minute for the two grades of avgas, and 4,000 gal. a minute for turbine fuel.

Normally jet planes take on fuel at the rate of 1,000 gal. a minute, or 500 gal. at each wing. Avgas fuel rates run about 400 gal. a minute.

Filtering system . . . The fuel going into the planes through the new system is filtered at least four times.

The fuel is filtered as it leaves the refinery, when it arrives at the bulk station, when it moves out of the station, and as it goes into the planes. Fiber glass cartridge-filtering systems are used in all stages but the last. A pleated paper cartridge is used on the fueling trucks as the fuel moves into the planes.

A part of the filtering system is an electronic water detector developed by Standard of Cal engineers. The detector is a two-phase water probe near the bottom of the filtering vessels. A band at the bottom of the probe gives the first indication of water and if the water level hits a second band further up the probe, the outlet valves automatically close and shut off the fuel supply. However, no water has been detected in the system so far.

The final filtering and metering is done from fuel trucks which connect the hydrant system to the planes.

Once a fuel truck is in place, a signal from the fueling pit can move by leased telephone lines to the bulk plant. The signal starts the lead pump. If more pump capacity is needed, additional pumps come into service until the plane's requirement is met. As demand slacks off, the pumps go off one at a time in reverse order. The last pump runs a few minutes after the signal in order to provide for topping off the fuel supply.

Critical Decision in Iraq Only Delayed

• A showdown is coming between IPC and Premier Kassim, and on that meeting will ride the future pattern of oil operations around the world. The outlook: On some points, IPC won't budge, and Kassim has gone too far now.

Paul Swain
International Editor

IRAQ has become the first—and at the same time, decisive—line of defense for western oil companies trying to stave off almost continuous assaults against their traditional position as oil producers in backward, mineral-rich countries of the world.

Iraq wants, and is insisting upon, a radical change in its relationship with Iraq Petroleum Co., the western-owned company which produces its oil. Owners of the company resist any such change because it will bring similar demands from every other oil-producing country in the Middle East.

The owners have a number of other, and very logical, reasons for resisting the Iraqi demands, but the pattern they would set by giving in is unmistakable.

For more than 10 years now, IPC has produced oil which supplied a large part of western Europe's increasing energy needs. The company has divided the profits from its producing operation half and half with Iraq. Like other Middle East oil-producing nations, Iraq is no longer satisfied with this arrangement. It wants a bigger cut of the profits and, in addition, a 20% interest in IPC itself.

Nothing unusual . . . These demands aren't really new. They have been made in one form or another over the past 3 years since the revolutionary government of Abdul Karim Kassim came to power in Baghdad. They are not too different from the aspirations of other oil-producing countries in the same region. Some new agreements have been made on a similar basis, but the old established money-in-the-bank concessions have never been breached.

The difference with Iraq is that her military strong-man premier has reached the "point of no return" in his demanding. He can't back away without losing power with the Iraqi people. There is every indication that the companies which own IPC will resist his demands to the last ditch when it comes to giving Iraq an ownership interest in the company. What happens then is anybody's guess.

The latest in a long series of negotiations between IPC and the Iraqi Government has been recessed without Kassim's getting his way. Talks are to be resumed in a month—but if IPC's owners will be any more ready to bow to Kassim at that time, there is no indication of it.

The late-August meetings in Baghdad were billed by the Iraqis as the "final" talks. This time, Kassim assured his people, he would "wrest the rights of the Iraqi people" from the foreign oil company. The IPC negotiating team was a new, blue-ribbon aggregation led by H. W. Fisher, Jersey Standard director, and it included F. J. Stephens, new chairman of Shell Transport and Trading Co. The Iraqis looked on this kind of representation as an assurance there would be no further necessity for the IPC team to halt the meetings for further instructions from owner companies.

After four meetings in Baghdad, the new IPC team headed for home in London for a 4-week recess to prepare detailed statements for Kassim on the points still in dispute. The group of western oil men made no secret of the fact they hope to impress the Iraqi premier with the intricate problems faced today by the international oil industry—oversupply and stiff competition for markets which will only be stiffer when Libyan oil reaches the market.

Kassim is stubborn . . . Premier Kassim will not be very impressed.

"In no circumstances will we retreat from our present position," Baghdad radio quoted Kassim last week in a comment on his demand that Iraq have a 20% interest in the company and a larger share of the oil profits. This public comment is typical of those Kassim has made to his people for weeks. He is on record and cannot back away even if the companies could convince him that this is not the time to be demanding more profits.

One big hitch in meeting Kassim's demand for a 20% interest in the big company: Compliance would mean putting a price tag on such a share.

IPC is actually a group of three companies, each holding separate concessions in the country. IPC itself produces the big Kirkuk field, Mosul Petroleum has other producing properties in the north, and Basrah Petroleum operates the producing fields in southern Iraq. Ownership of the three companies is split like this: Royal Dutch-Shell, 23.75%; British Petroleum, 23.75%; Cie. Francaise des Petroles, 23.75%; Near East Development Co. (Socony Mobil-Jersey Standard), 23.75%; and the Gulbenkian Estate, 5%.

The three companies currently produce 986,000 bbl. daily from all their properties in Iraq.

In addition they are expanding producing and shipping facilities. Large capital outlays are involved: Expansion of facilities in southern Iraq alone is costing $70 million. This includes a deep-water terminal being built 24 miles offshore from

Fao at the head of the Persian Gulf, a 30 to 32-in. loop to the existing offtake facilities from Rumaila and Zubair fields, and a development drilling program in the fields.

IPC also has invested a large sum in a 530-mile, 30-to-32-in. loop in the big pipeline system from Kirkuk to Tripoli, Lebanon. Now nearing completion, the loop will increase the capacity of the company's major pipeline system to the eastern Mediterranean from 700,000 to 960,000 bbl. daily.

French Hit Again Near Their First Libyan Discovery

THE FRENCH have brought in a successful well 9 miles from their first discovery in Libya.

Cie. des Petroles Total (CPTL) has encountered oil in its B 1 wildcat in Block 61. This block lies to the east and south of Block 23, where the company's E 1 came in as a 1,932-bbl. well (OGJ, July 3, p. 99). Tests on the latest find were scheduled to take place last week. The well is at 9,751 ft.

The wildcats, which offer the first hope of commercial oil for CPTL after years of search, are in Northwest Libya about 85 miles from the Mediterranean coast. Shell's Tlacsin discovery lies 60 miles to the southwest, and Oasis' B 1 find on Block 26 lies 150 miles to the southwest.

Production Tests Due for Iranian Oil Find

THE Iranian Consortium will run prolonged production tests on a 3,500-bbl. discovery west of Gach Saran oil field, but the new find will probably have to turn in a good performance to rate full-scale development next to its prolific neighbor.

The well, 1 Bibi Hakimeh, located 22 miles southwest of Gach Saran, reportedly flowed the 3,500 bbl. daily after treatment.

Initial results at Bibi Kakimeh look less impressive when compared with drilling results at Gach Saran. The latest field well, No. 35, has been completed with a flow of 36,600 bbl. daily. Nos. 37 and 38 are drilling.

Phillips Lays New Pipeline

. . . to Venezuela's Morichal field. Part of production will go to fuel-oil marketers on U. S. East Coast.

PHILLIPS Petroleum has opened a new pipeline system in eastern Venezuela that will give a newfound crude supply access to world markets.

The 42-mile, 24-in. system began August 12 to move about 25,000 bbl. daily of heavy crude produced by Phillips and seven partners from Morichal field in southern Monagas State.

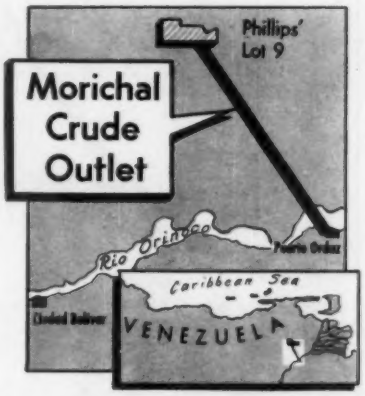
Phillips, the leading partner with 55.75% interest in both the field and pipeline, reportedly has already tied down some sales to fuel-oil marketers on the U. S. East Coast. The balance of the production will be offered in world markets. The crude's heavy 9° to 14° gravity should make it a tough competitor in foreign areas where residual is in great demand.

Other partners in the production are Sunray Mid-Continent, with 17.27%; Ashland Oil & Refining, 10.79%; Kerr-McGee Oil Industries, 5.40%; El Paso Natural Gas, 3.2%; Western Natural Gas, 3.2%; and Pacific Petroleum, Ltd., subsidiaries, 4.32%.

The pipeline . . . Terminal of the $15 million system is on the south side of the Orinoco River, 6 miles from Puerto Ordaz, which lies 160 miles upriver from the Atlantic.

The 1-mile river crossing was the first ever made across the Orinoco, one of South America's greatest waterways.

The line, along the shortest route



to water transportation, was made feasible by dredging of the Orinoco to a 34-ft. depth in order to accommodate oceangoing ore carriers. Creole only 2 years ago was obliged to build a longer line from the same area to Caripito, a river terminal lying closer to the ocean.

Morichal field . . . Phillips has completed a 31-well development program in Morichal which covers about 7% of the 25,000-acre tract.

The concession was acquired in February 1957 for $11,257,000, and the Phillips group came up with a 1,200-bbl.-daily discovery the following year. The pay was from three zones of the Oficina sand between 3,200-4,100 ft.

The second well, 4½ miles west, and the third test, 5¾ miles west of the discovery, encountered comparable pay sands. Each well has better than 350 ft. of net pay.

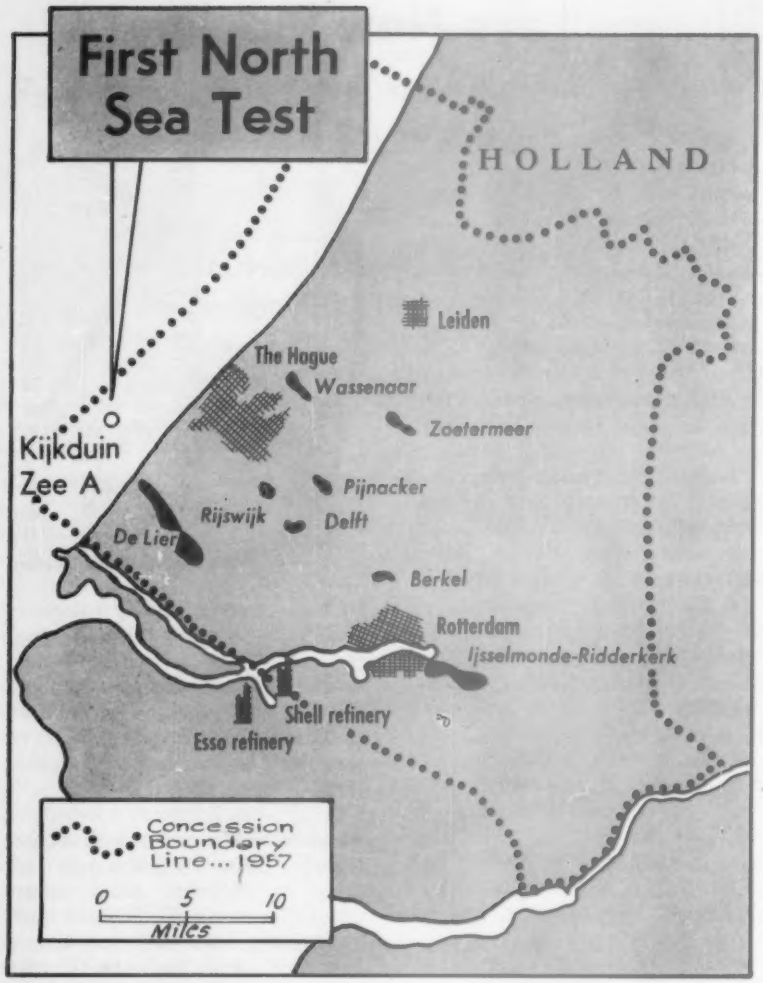
Yugoslavia to Step up Gas Production

YUGOSLAVIA plans to start making better use of its natural-gas supplies.

The country's known reserves of 350 billion cubic feet are not large, but they could support a much higher level of production than the 5,000 M.c.f. daily now used commercially. By 1965, the government hopes to step up deliveries to 39,000 M.c.f. daily through an expansion of pipeline outlets.

One line already under construction in the northeast part of the country will deliver gas from the Kutina area to Pancevo. It will supply gas to a 360,000-tons-per-year fertilizer plant and a petrochemical development.

Another system will be built in the next 4 years to supply petrochemical and heating customers in the vicinity of gas fields in the Drava River area. A longer line from the area will be laid to points along the Sava River.



NAM Tries Its Luck Offshore

- **Dutch company moves big mobile drilling platform into position for kickoff wildcat. Target is 6,500 ft.**

A NEW 2,400-ton, British-built, mobile drilling platform has been moved onto location for the first offshore test ever to be drilled in the North Sea.

The "Triton" is rigging up for Kijkduin Zee A wildcat 2½ miles off the coast of the Netherlands between Scheveningen and The Hook. The test is projected to 6,500 ft., in search of the same productive horizons in a cluster of on shore fields.

The NV. Nederlandse Aarodlie Mij. platform will house two drilling crews simultaneously, with a total complement of 38 men. The four 170-ft. legs will be able to lift the platform 40 ft. above the frequently turbulent waters of the North Sea.

The offshore venture will be an attempt by the jointly owned Jersey Standard-Royal Dutch Shell company to press its good luck further in exploration in Holland (OGJ, July 31, p. 121). In the past 7 years NAM has brought in more than a dozen small fields in the Rotterdam area, which now account for more than half of the country's 38,000-bbl.-daily crude production.

The company also brought in a major gas find in the northern Netherlands last year, at Slochteren. The government—on the basis of the initial information—said reserves were in at least the 2-trillion-cu.-ft. range, which makes the field one of the most important finds in Europe.

If the onshore successes are repeated offshore, there will be few problems in transporting the crude to market. Both Shell and Esso have large refineries within about 30 miles of the wildcat location by water transport.

Tidewater, Stanvac Plan Tests On New Pakistani Acreage

IRON curtain technicians soon will be competing side by side with private oil companies in West Pakistan.

An initial group of 10 Russians will arrive in the country in either September or October. This group, which is to be followed by more technicians from behind the iron curtain, will carry on a program in the Potwar area of West Pakistan, where British companies produce less than 8,000 bbl. daily.

The Russians will carry on the program on behalf of the Pakistan Government, which has accepted a Russian offer for about $35 million worth of equipment and expert services over the next 5 years (OGJ, July 17, p. 66).

At the same time, Tidewater Oil Co. is shifting its emphasis to Baluchistan, where it recently obtained rights covering 1,773 sq. miles in exchange for an equivalent area given up around Karachi. The swap means that the company continues to hold concession rights over 10,000 sq. miles, the maximum permitted by Pakistani law. The first wildcat on the new acreage will be started late in 1961 or early 1962.

Tidewater is giving up 1,773 out of 2,473 sq. miles of concession rights in West Pakistan. The acreage involved lies in the Karachi, Thatta, and Dadu areas where the company has had bad exploration luck since entering the country 3 years ago.

Stanvac, meanwhile, is rigging up for a wildcat at Badin, in the Sind area of Hyderbad, West Pakistan. The well, projected to 9,000 ft., is on a 540-sq.-mile concession that has just been officially awarded to the company. The concession runs for 4 years with a 1-year extension. The government has 25% interest in the venture.

De Gaulle Willing to Yield Title to Sahara

• French president's move for accord in Algeria hinges on one big condition: His country must be allowed to exploit oil already found.

GENERAL Charles de Gaulle last week dangled before the eyes of Algerian nationalists a possible political solution to the bloody, 7-year-old Algerian rebellion.

In an about face, the French president offered the Algerians political sovereignty over the vast Sahara Desert on the condition that the French be allowed to continue to exploit the oil they have found.

De Gaulle's move was an obvious effort to lure the nationalists back to a peace-conference table. Peace talks in neutral Switzerland broke down completely weeks ago, with the future of the Sahara and its oil as the major stumbling block to any agreement.

Until last week the official position of the French has been that the Sahara and Algeria are separate territories. They went to the peace conference ready to give the Algerians a chance to become independent, but without any hold on the vast desert area south of the Atlas Mountains.

There is no oil in Algeria worth fighting over. The Sahara is something else.

The conciliatory De Gaulle move came during a press conference in Paris. He publicly recognized the futility of past French policy in trying to keep the Algerian question and the Sahara separate.

"The realities are that there is not a single Algerian—I know this—who does not think that the Sahara should be a part of Algeria," he said. "And there would not be a single Algerian Government, whatever its orientation toward France, which could not demand without ceasing, Algerian sovereignity over the Sahara."

The French president, obviously eager to settle the long and costly Algerian warfare, made it clear that he would expect an independent Algeria to make agreements with the French to "cooperate" on oil development. The move came just 10 days after Youssef Ben Khedda, a left-wing radical nationalist, took over as head of the National Council of the Algerian Revolution in Tripoli. Ben Khedda replaced the far more moderate Ferhat Abbas, whose representatives could not come to terms with the French. The new regime of Ben Khedda is generally assumed to be even tougher for the French to deal with.

The Tunisian issue . . . At the same press conference, De Gaulle turned his back on any immediate solution of the French dispute with Tunisia over the naval base at Bizerte. He said flatly he will not negotiate with Tunisia for French withdrawal while things remain tense.

De Gaulle said President Habib Bourguiba of Tunisia has made it clear that he wants a part of the Sahara for Tunisia and really wants to control the Edjele oil fields "at the expense of Algeria."

The 24-in. pipeline serving the Edjele-area oil fields has not been in operation since July 21 when the fighting over Bizerte broke out. The pipeline, one of two major lines moving Saharan oil to the Mediterranean, passes through Tunisia. It has been estimated that Bourguiba is costing the French $400,000 a day in oil revenues as long as he keeps the Edjele pipeline out of operation.

Soviet Oil Deals Menacing

• Fears of major threat to western oil industry are supported by Russian figures on their "aid" policy.

RUSSIAN statistics are tending to confirm the western view that soviet equipment and technical aid may pose a greater threat to the western oil industry than exports of cheap crude.

During the past 2 years, soviet obligations for some type of industrial plants or other projects have increased 55% in the satellite countries, and 165% in the underdeveloped countries of the free world, according to the latest figures issued by the USSR's Ministry of Foreign Trade.

Many of these obligations cover either exploration assistance and oilfield equipment or processing equipment being delivered to free-world countries. The menace is that each of these oil deals ties some satellite or one of the less developed free-world nations a little closer to Moscow.

Russia last year exported 5,600 tons of oil equipment to both satellite and free-world countries. This was a considerable volume, even if down from the 6,200 tons exported in 1959. Soviet technicians also are helping out government-run exploration programs in India, Pakistan, Iraq, and the United Arab Republic (OGJ, June 26, p. 134). Nationals from at least some of these countries are being brought to Russia, especially Baku, to study Russian drilling, producing, and refining methods.

The ministry says the USSR in recent years has agreed to provide help for the construction of 28 oil and shale-oil refineries.

Twenty-one of the projects are within the soviet bloc, and these when completed will have a total capacity of over 400,000 bbl. daily. Among the satellite projects are a large plant being built at Plock, Poland, expansion of a refinery at Burgas, Albania, from 20,000 to 40,000 bbl., construction of a 20,000-bbl. unit at Lanchow, China, and a proposed refinery in North Korea.

Seven projects outside the soviet sphere are included in the ministry's report: Two refineries in India, four in the UAR, and one in Ethiopia. (The Emperor of Ethiopia reportedly has dropped the scheme for a Russian-built plant.) The soviets recently agreed to finance and supply equipment for a third refinery in India, a 40,000-bbl. plant at Gujarat.

Ohanet Oil Flows Through New Algerian Line

• Gravity line links Ohanet field with Hassi Messaoud system. If Tunisian troubles continue, spare capacity could handle part of Edjele-area output.

CRUDE from another of the new North African oil fields will go to market by late fall with the opening of a pipeline outlet in the French Sahara.

Mobil International and its French partners have completed a 321-mile 30-in. pipeline linking Ohanet field with the input terminal of the 24-in. Hassi Messaoud-Mediterranean pipeline. This system is already moving about 178,000 bbl. daily of Hassi Messaoud and El Agreb crude to the coast.

The new line, now being filled, will give Mobil the distinction of being the first American company to have its own Algerian crude production. The company has 25% interest in Ohanet field, and its share of output will give it an advantage in France, where it operates a 31,500-bbl. refinery at Gravenchon and a 27,000-bbl. plant at Frontignan.

Cie. d'Exploration Petroliere (CEP) and associated French companies have 75% interest in the discovery concession, which covers approximately 8 million acres. CEP is operator for the program.

The pipeline connection with Hassi Messaoud was one of two possible tie-ins from Ohanet, discovered last year about 350 miles south of the Mediterranean near the Libyan border. The other connection could have been made with the pipeline running northward from Edjele to the coast of Tunisia.

Ohanet lies within about 30 miles of the Edjele pipeline. But Ohanet will flow by gravity from Hassi Messaoud, while pumping facilities would be needed to move the oil through a shorter tie-in to the Edjele line.

Political as well as economic reasons also undoubtedly played a part in building a longer line to Hassi Messaoud. If the French had any premonitions of impending trouble with Tunisia, these have been borne out by the recent armed clash over Bizerte. The Tunisians seized and shut down the CREPS system the last week in July and say the line will not be reopened until the Bizerte question is settled. Meanwhile, CREPS production, which has averaged as much as 184,000 bbl. daily, remains shut in.

The 30-in. line from Ohanet may, in fact, have been purposely built with spare capacity that could handle at least part of the output from the Edjele area in an emergency. Pumping facilities already in service at Edjele could readily push crude from the area 50 miles or so to Ohanet.

Ohanet development . . . Planned throughput of the Ohanet system has not been disclosed. But CEP has completed 15 to 20 field wells, and two rigs are currently drilling.

Ohanet 1 wildcat came in as a discovery in April 1960 with a flow of 1,900 bbl. daily through a 1-in. choke. The 38°-gravity oil came from a zone at about 7,740 ft. "Substantial" quantities of gas were found in zones immediately above the oil pay.

Ohanet 2 confirmed that the CEP-Mobil group apparently had a major oil field in hand when the stepout, 4 miles north of the discovery, tested 2,000 bbl. daily through a ¼-in. choke. Tests were made on an 85-ft. pay of lower Devonian sand at 7,650 ft. (OGJ, Aug. 1, 1960, p. 103).

Majors Sign Australian Deal

OHIO Oil and Continental Oil have acquired exploration rights on more than 8.3 million acres in Northeast Queensland, Australia.

Wholly owned subsidiaries of the two companies have each obtained a one-half interest in the new 13,800-sq.-mile area, subject to an overriding royalty retained by three Australian companies from whom the rights were acquired. The firms are Associated Australian Oilfields NL, Associated Freney Oil Fields, Ltd., and Papuan Apinaipi Petroleum Co., Ltd.

The Australian Government has approved the deal. Ohio's subsidiary, Ohio Oil International of Australia, Ltd., will be the operator.

Paul L. Henderson, vice president of international production for Ohio, said the initial agreement is for a period of 4 years, with a right of renewal for an additional 4 years. If oil is found, mining leases can be acquired which have initial terms of 21 years, and are renewable for additional 21-year periods.

Under terms of the concession authority, 25% of the acreage must be surrendered by September 30, 1963. Assuming the rights are renewed, another 12½% per year must be relinquished for 3 years starting September 30, 1965. The surrenders are mandatory whether oil has been found or not.

The acreage lies to the northeast of a tract covering more than 11 million acres acquired earlier by Ohio, Continental, and Amerada Petroleum.

A refinery is born

The first stirrings on the site of a refinery-to-be. The scene here is in Belfast, but it is typical of many other sites - in Europe, Africa (North, South, East and West) and the Middle East.

In sixteen widely separated places refineries are being planned or built or are undergoing major expansion by BP and its associates... tangible symbols of progress with British Petroleum.

BP

When does vapor recovery pay off?

Gas vented from lease storage batteries in the U. S. is worth about $35,000,000 per year. Large-volume storage areas are ideal for vapor-recovery systems, but small leases are susceptible too. Here's how to evaluate your leases and see if a recovery system will pay out.

BY R. E. WELDON, JR.
Atlantic Refining Co., Dallas

ANSWER THESE QUESTIONS and you are on your way toward finding out which tank batteries are potential applications for vapor recovery.

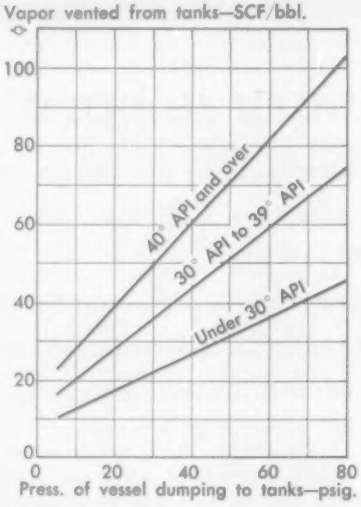
- Is there a market for low-pressure gas?
- How much gas is being vented?
- What is the value of the gas?
- What will it cost to deliver this gas to market?

During the past 3 years Atlantic Refining Co. has installed vapor-recovery facilities on three tank batteries with total production of about 33,500 bbl. per day. For a total investment of $50,000, Atlantic and its coowners are realizing a net income of about $360,000 per year by recovering vapors that had previously been vented. Needless to say, this has spurred our efforts to find more applications for vapor recovery. But, back to those questions.

Low-pressure-gas market. Unless a large volume of tank vapors is available, the gas market should be a gasoline plant or similar hydrocarbon-recovery plant where payment depends upon the value of the liquids recovered. Normally, leases where separator gas is being sold to gasoline plants under a casing-head-gas contract will meet this requirement. Most of these markets have delivery pressures less than 50 psig. In some cases the delivery pressure is higher than the separator pressure and the separator gas has to be compressed up to the sales-line pressure. These compressors will usually have enough additional capacity to handle tank vapors boosted to their suction pressure by a vapor-recovery compressor.

Presented at the spring meeting of southwestern district API Division of Production, Albuquerque, March 1961, under the title "Recognizing and Evaluating Stock-Tank Vapor-Recovery Applications."

Volume of tank vapors being vented. It is difficult to arrive at a rule of thumb that can be used to estimate the volume of gas being vented from a particular tank battery. Probably the most important factors are the pressure of the separator or treater that is dumping to the tank, and the gravity of the oil. Fig. 1 gives a rough estimate of the volume of gas that will be evolved per barrel of oil if the separator pressure and stock-tank oil gravity are known. This curve is based on flash data from laboratory studies of various crudes and on a few actual field-measurement tests. The curve should not be used as a substitute for actual measurement of gas in the evaluation and design of a particular vapor-recovery system. However, it is helpful for recognizing which batteries have potential vapor-recovery applications.



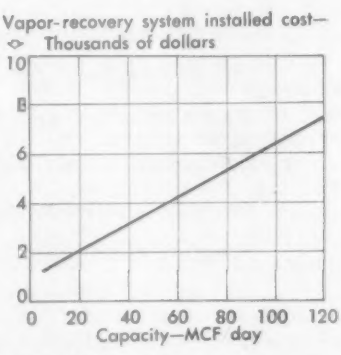
VOLUME OF VAPOR vented from lease stock tanks can be estimated from this chart. Fig. 1.

Value of tank vapors. Producer's income from tank vapors depends on the liquid content, gasoline-plant efficiency, price of liquid products recovered, and the terms of the casing-head-gas contract. As a rule of thumb, a net value of 35 cents per 1 M.c.f. can be used. This is the net income to the lease. Where the producer owns a share of the gasoline plant, the income per 1 M.c.f. would, of course, be higher.

Cost of vapor-recovery systems. There are many factors that affect the cost of stock-tank-vapor recovery: Sales-line pressure, volume of gas, number of tanks in a battery, type of compressor, type of compressor drive, and degree of automation are just a few. Fig. 2 gives the approximate cost of small vapor-recovery systems as a function of gas rates for discharge pressure up to about 25 psig. This can be used as a rule-of-thumb cost, or an estimate can be obtained from one of the manufacturers of packaged vapor-recovery units.

Evaluating a Specific Application

By applying these approximations, the producer can determine



APPROXIMATE COST of vapor-recovery systems for discharge pressures up to 25 psi. can be found from this correlation. Fig. 2.

which batteries are the best prospects for tank-vapor recovery. To evaluate one of these prospects, it is necessary to take the following steps:

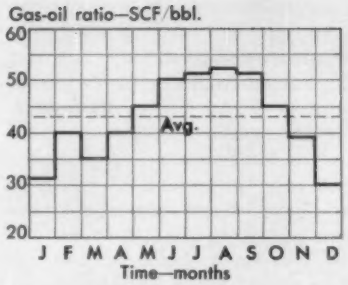
1. Measure the volume of tank vapors being vented.
2. Measure the liquid content of the gas.
3. Figure the economics.

Gas measurement. An orifice well tester and a recording manometer can be used to measure the gas being vented from a tank battery. The pressure recorder should have a small range inasmuch as the differential to be measured is very low. A range of 0 to 5 in. of water is well suited for this application. The orifice well tester can usually be installed in the tank-battery vent line.

Pressure on the tank can be controlled by the size plate installed in the orifice well tester. To get a representative test, the pressure should be about the same as it would be with the vapor-recovery system. This will usually be from 1 to 3 in. of water. Prior to the measurement test, the tanks should be checked for leaks, and any leaks repaired. The operating conditions of the lease-separation equipment and the producing rate should be set as close to normal as possible. The test should be conducted for several days to get some idea of the variation in flow rate with temperature, liquid level in the tank, filling and emptying cycles, and weathering time.

Specific gravity of the vapors should be measured as often as possible throughout the test to get a representative average. Gravity will vary considerably with liquid surface temperature, and gravity measurements should be made both during the day and night to arrive at a good average. For most accurate results, the temperature of the gas flowing through the orifice should be continuously recorded.

The volume of gas obtained with a vapor-recovery system has been consistently higher than was measured with the orifice well tester. This has varied from 1.3 to 1.6 times as high as was predicted. Other operators have reported similar experiences. Magnitude of this variation depends on when the test is conducted. The difference will be greater where a test is run during the winter months than if the test is run during the summer, when compared with the average daily volume of vapors recovered throughout the year with a vapor-recovery system.



GAS-OIL RATIO for Block 31 vapor-recovery system varied with the seasons as shown on this chart. Fig. 3.

Fig. 3 gives the month-to-month variation in the stock-tank gas-oil ratio at Block 31. The average gas-oil ratio for the year was 43 s.c.f. per bbl. When we measured the gas to evaluate the economics of vapor recovery, we obtained a gas-oil ratio of 29 s.c.f. per bbl. The test was run during June. If it had been run in winter, the difference between the predicted and actual gas-oil ratio probably would have been greater.

We believe that the economic and design calculations should be based upon higher gas volumes than are actually measured. Based on experience to date, we believe that to calculate the yearly income, the average gas rate measured should be multiplied by 1.3 if the measurement test is conducted during the summer months, and 1.5 for winter tests. As a rule of thumb, the gas rate obtained during the test might be doubled for equipment-design purposes.

Liquid content of gas. Price received from the sale of gas under most casing-head-gas contracts is based on the liquid content of the gas. Stock-tank vapors will often be 4 or 5 times as rich as separator or treater gas.

Three common ways in which gasoline plants allocate liquid products are the compression-test basis, the charcoal adsorption method, or on the basis of gas analysis.

Regardless of which method is used, it is important to get an accurate measurement of the liquid content of the gas to evaluate the economics of recovering stock-tank vapors. Tests can be run while gas is being measured, and several tests should be made in order to get an average. That is, the richness of the gas will vary from time to time, depending on the temperature of the liquid surface in the stock tank. The vapors will be richer in the summer than in winter, so tests run in winter should be adjusted upward, and those in summer adjusted downward to get a yearly average.

Variations in the liquid content of vapors over a period of 1 year, from Atlantic's Block 31 project are given in Fig. 4, from a minimum of 7.75 gal. per M.c.f. in January to a maximum of 9.0 gal. per M.c.f. in July. This curve can be used as a guide in making adjustments for finding a yearly average from tests

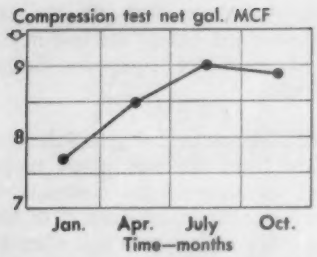
TABLE 1—GAS-OIL RATIO DATA FROM ATLANTIC'S VAPOR-RECOVERY SYSTEMS

System	Separation Conditions* Pressure, psig.	Separation Conditions* Temperature, °F.	Stock tank oil gravity °API	Gas-oil ratio S.c.f./bbl.
Block 31	20	150	47	45
Magnolia	15	75	40	38
State "T"	15	110	45	35

*Separator or treater dumping to the tank.

TABLE 2—LIQUID CONTENT OF STOCK-TANK VAPORS—GAL./M.C.F.

Component	Magnolia	Block 31	State "T"
Propane	8.48	10.26	6.50
i-Butane	2.07	1.73	2.01
n-Butane	4.39	6.82	4.68
i-Pentane	1.38	1.37	1.36
n-Pentane	1.27	1.88	1.28
Hexanes	0.49	1.84)	0.61
Heptanes plus	0.84	)	0.30
Total	18.92	23.90	16.74
Gas specific gravity	1.53	1.70	1.40
Oil gravity, °API	40	47	45
Month measured	September	June	January



LIQUID CONTENT of vapors from Block 31 vapor-recovery system varied with time over a period of 1 year. Fig. 4.

taken during only one season of the year.

Table 2 was prepared from gas analyses of stock-tank vapors from three Atlantic vapor-recovery projects. It is obvious that there is no direct correlation between the liquid content of vapors and the API gravity of the oil associated with those vapors. Table 2 shows a liquid content of Block 31 vapors, in June, to be 23.90 gal. per M.c.f., and Fig. 4 shows that the liquid content was about 8.75 gal. per M.c.f.

Economics. With the gas volume and liquid-content data from the testing program, the income from the sale of tank vapors can be found by referring to the casing-head-gas contract serving the lease. Royalty, taxes, and operating costs should be deducted to determine the net income. Any benefits, such as personnel safety and reduction in tank corrosion, should be included also in the justification, where applicable.

An estimate of the cost of a skid-mounted, vapor-recovery unit can be obtained from one of the manufacturers of this type of equipment. These packaged units are complete in that they normally only require connecting to the suction, discharge, and power source. Any other equipment needed to adapt the tank battery for vapor recovery and the labor required for installation will have to be added to the cost of the packaged unit to obtain a total installation cost. With these data, the producer can then determine if it is profitable to install a vapor-recovery system on this battery.

Field Examples

Block 31 field. All Devonian production from the unitized Block 30 field in West Texas is gathered from separation stations to a central battery consisting of four 20,000-bbl. tanks. The central battery handles 15,000 bbl. of 47° API oil per day. Stock-tank vapors are compressed to about 25 psig., Fig. 5, and injected into our Block 31 gasoline-plant gathering system. The system cost about $30,000 and paid out in 2 months.

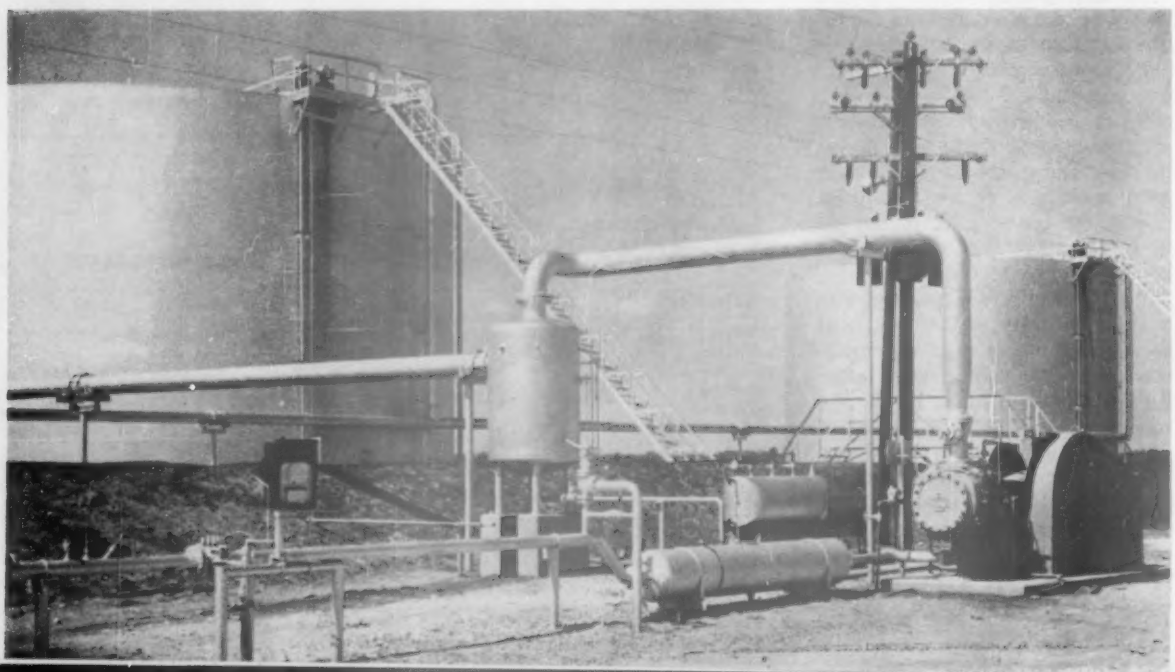
During 1959, we recovered an average of 686 M.c.f.d., and the net income to Atlantic and its coowners was about $230,000. This includes both lease and plant income.

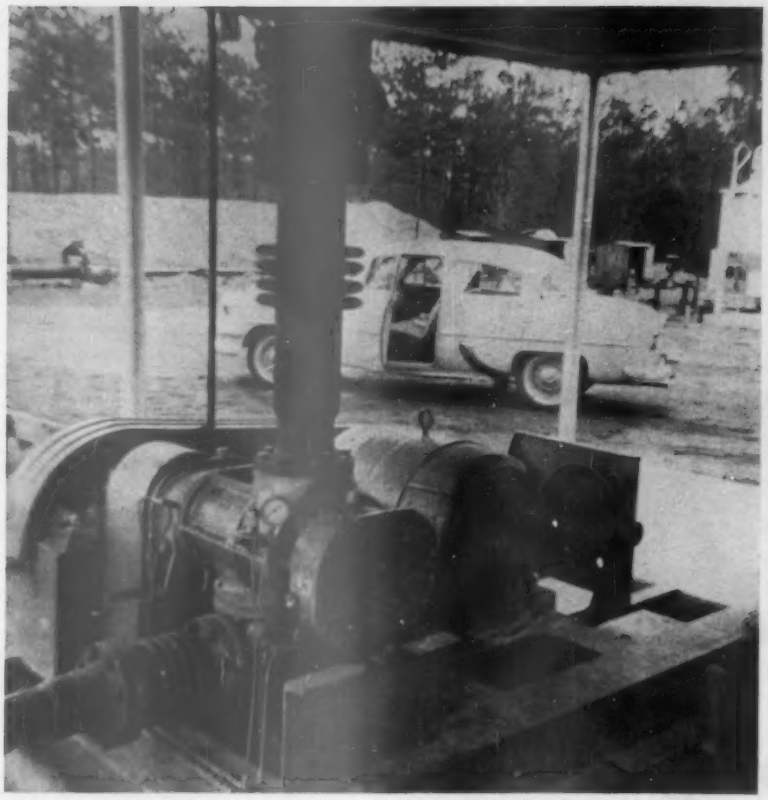
Magnolia field. All oil in this unitized southern Arkansas field is brought to a central point for sale through LACT units (OGJ, Feb. 20, 1961, p. 144). The oil is separated at four test stations and gathered to the central facilities where the oil from each station flows through a separator operating at about 15 psig., after which it is dumped to a 20,000-bbl. surge tank. The daily production to this tank is 17,500 bbl. of 40° API oil.

A tank vapor-recovery system was installed in conjunction with the central facilities. Vapors are compressed to about 15 psig., after which they are combined with the 15-psig. separator gas and compressed to a pressure of about 100 psig. for injection into a gasoline-plant gathering system, Fig. 6. The system cost about $15,000 and is recovering about 700 M.c.f. per day. It has been in operation about 9 months and, based on this period of operation, yearly income to the unit will be about $125,000. The unit gets 60% of the liquids recovered by the gasoline plant plus the income from sale of residue gas.

State "T" lease. The vapor-recovery system on the State "T" lease in Denton field, New Mexico, is much smaller than the two previously described, Fig. 7. This system gathers vapors from two tank batteries and commingles them for compression to 15 to 20 psig. for delivery to the Denton gasoline plant.

RECOVERED VAPOR from Block 31 central battery is compressed to about 25 psi. and injected into the gasoline plant gathering system. Fig. 5.





THIS COMPRESSOR handles vapors from Magnolia field LACT system surge tank. Compressor output at 15 psig. is mixed with separator gas at the same pressure, and the mixture is further compressed for delivery to a gasoline plant. Fig. 6.

The properly designed system prevents any air from entering the tanks, eliminating or greatly reducing tank corrosion and fire and explosion hazards. All our systems have gas-blanketing facilities which prevent air from entering the tanks during normal operation. Safety to operating personnel is also a big benefit, especially in fields where sour gas is produced. Coupled with ground-level tank gages and LACT facilities, the tank vapor-recovery system practically eliminates the sour-gas hazard.

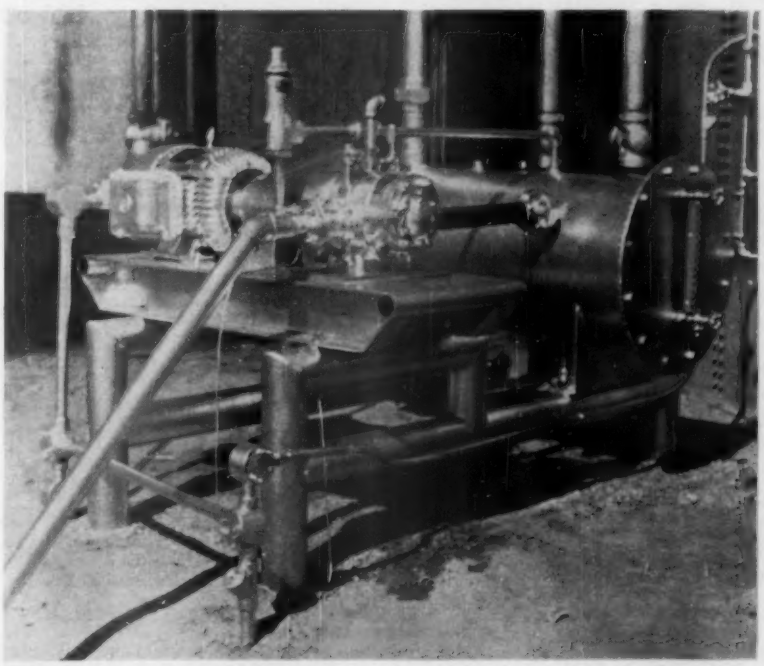
Block 31 and the Magnolia vapor-recovery systems resulted from tank-battery consolidation. However, in both cases, tank vapor recovery was not used as a part of the justification for consolidation of batteries. This additional justification was not needed for these two battery-consolidation projects, but had either of these been economically borderline cases, the additional income from vapor recovery would have made a big difference in the economics of the over-all project. When considering projects involving consolidation of tank batteries, one should be careful not to overlook the tank vapor-recovery possibilities.

The two batteries are side by side, one having five 1,000-bbl. tanks and a 1,500-bbl. power-oil tank handling Devonian production, and one with three 1,000-bbl. tanks and a 1,500-bbl. power-oil tank handling Wolfcamp production. The tanks are manifolded together into a common vapor-gathering system. Total production to these two batteries is about 1,100 bbl. per day and the oil gravity averages 45° API.

This system cost $4,700 and is recovering about 40 M.c.f. per day. Net income from this system will be about $8,000 to $10,000 per year. This includes lease income plus our share of the gasoline-plant income, which is about 10%.

Benefits of Vapor Recovery

These examples show that substantial income can be realized from the sale of tank vapors. There are other benefits that are often overlooked and on which it is hard to place a monetary value.



STATE "T" LEASE system handles vapors from two tank batteries and compresses them for delivery to the Denton gasoline plant. Fig. 7.

COMPLETE FILTERING UNIT at Douglas Aircraft's Long Beach plant. Lights on control panel indicate system ready or standby at Douglas and at storage location.

Terminal filtering cuts dirt in jet fuel

. . . *despite variable load*

• Cleanliness of fuel handled in Richfield Oil system exceeds accepted standards; requirements range from 0 to 100,000 gal. per day.

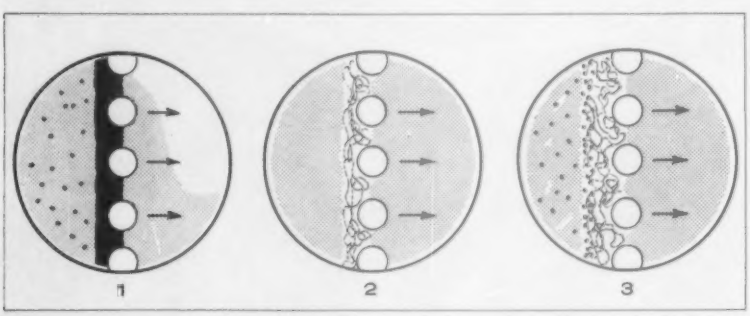
JET FUEL is being delivered by Richfield Oil Corp. via pipeline to new DC-8 jet airliners fresh off the assembly line.

An existing pipeline was converted for jet-fuel service, equipped with a filtering system, and is now feeding DC-8 airliners a fuel with a cleanliness of 0.1 and 0.2 mg. per gal.—considerably cleaner than that generally acceptable and several times cleaner than the fuel formerly delivered by tank truck.

BY J. M. TYGRET
Garner Pipeline Construction Co.,
Albuquerque, N. M.,
and
ROBERT ULRICH
Refinery Instrumentation Engineer,
Richfield Oil Corp., Los Angeles

Early in 1959 when the orders for DC-8 airliners began to mount and production of the planes began to formalize, it became increasingly apparent that permanently supplying fuel for these giant birds by truck to Douglas' Long Beach plant would not be satisfactory.

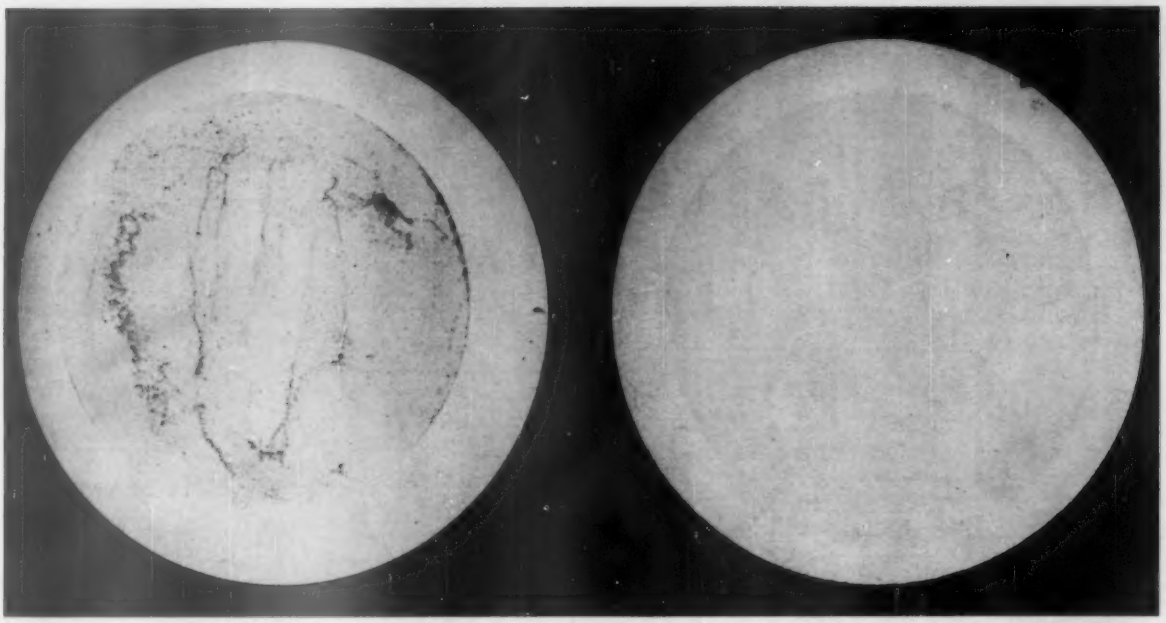
There would be a fluctuating demand for the jet fuel. For instance, the DC-8's require from 15,000 to 25,000 gal. of fuel to fill their tanks and, as part of the flight-test operations, testing of the fuel tanks is a major item. Many times fuel is pumped out of the aircraft shortly after it is pumped into the tanks. Some days, several aircraft would require fuel for test flights; other



IF DIATOMACEOUS earth is not used with fine-mesh screens, solids form a seal over the filter surface and stop the flow of the jet fuel.

FIRST STEP in the cycle of the use of the filter aid is to build up a "precoat" of the diatomaceous earth on the mesh.

DURING the filtering (delivery cycle) small amounts of the filter aids are continuously added to keep forming a fresh filter surface.



THESE TWO MILLIPORE FILTER ELEMENTS contrast the cleanliness of jet-aircraft fuel before and after entering the unit. Isokenetic samples were taken simultaneously from the incoming and outlet streams. The filter element at left shows a high concentration of dirt and particulate material from the pipeline. Filter element at right shows less than 0.2 mg. per gal. of solids remaining in the outlet stream. No filter aid has been witnessed in such test.

days none. One day may require 100,000 gal. of turbine fuel—the next day, none would be needed.

By the very nature of these conditions, Douglas would be unable to work out a smooth schedule for trucking fuel to the plant.

Therefore, an existing 4-in. pipeline that extends from Richfield's Hynes tank farm and runs adjacent to the Douglas plant was converted for jet-fuel service and extended into the aircraft plant to the area of a new hydrant - fueling system that was installed by Douglas and Richfield.

At the Douglas end of the line, an automatic filter-separator-meter assembly was installed.

The new facilities enable Douglas to receive clean jet fuel by simply pushing a button which in turn activates a pump at Hynes (approximately 4½ miles away). The fuel is pumped at rates up to 300 bbl. per hour through the pipeline and through the filter - separator - meter unit into Douglas' underground storage tanks.

1. Cleanliness

Reports from Richfield's research center showed jet engines are more sensitive to both particulate matter and entrained water than reciprocating engines.

Solid particles not only wear surfaces by abrasion and plug up small orifices by accumulation, but also act as nuclei for water droplets. Water causes deterioration by corrosion and, when frozen by low temperatures experienced at high-altitude flights, acts as abrasive as solid particles and clogs small lines and valves. The eventual effect of either of these contaminates could be the gradual lowering of performance and more frequent overhauls.

A secondary set of problems has to do with the fuel itself. The higher viscosities, wider - cut distillation characteristics, different specific gravities, and lower interfacial tension than avgas, all tend to cause both water and solid particles to stay in suspension longer in jet fuels.

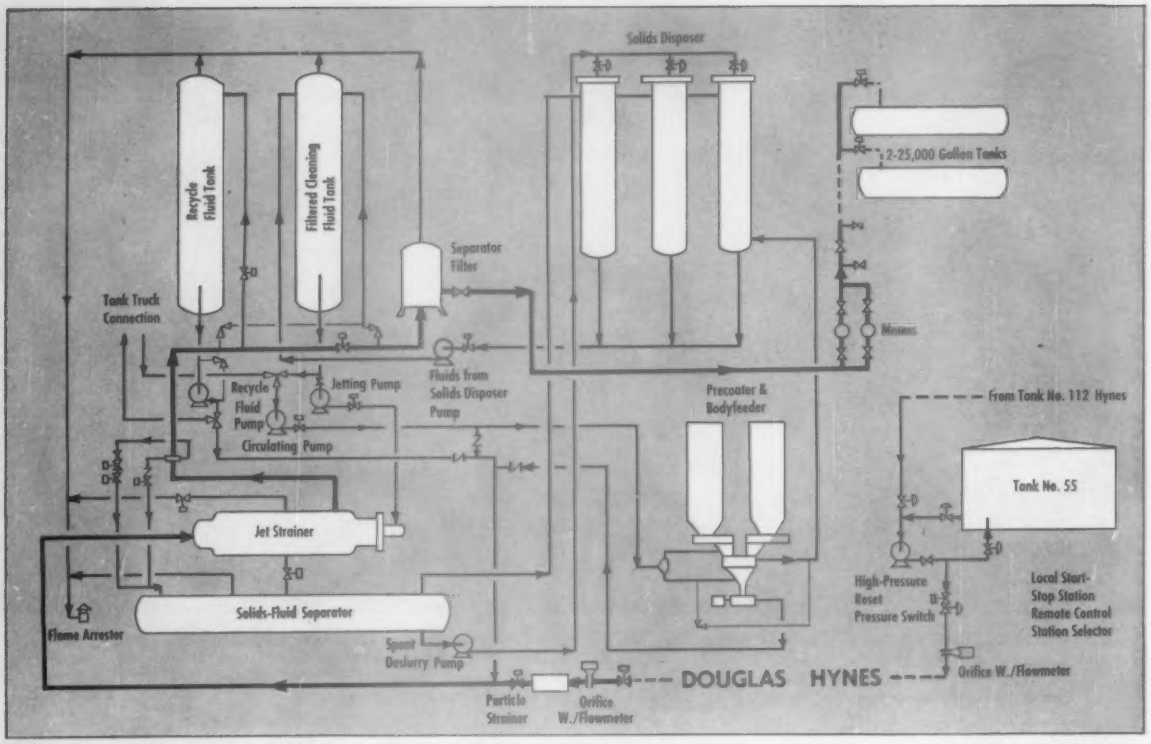
The authors say . . .

"We are very gratified to report that the test samples of the fuel delivery have more than met our design goal.

"When the unit was first placed into operation samples were drawn from the incoming pipeline stream. Day after day the incoming samples revealed that the line contained more than 1,500 mg. per gal. of particulate matter. However, samples drawn at the entrance into the Douglas storage tanks revealed that less than 1 mg. per gal. of particulate matter remained in the cleaned fuel. After a time, we felt that the piping in the filtering unit itself had cleaned-up to a point that we were consistently getting clean samples of less than 0.2 mg. per gal.

"Maintenance and repair costs on the unit have been very small, approximately 3 hours per week of normal maintenance is to be expected. This, to fill the diatomaceous-earth hoppers and to remove the dirty filter aid. Also, some time is required to service the various system pumps.

"We feel that the sampling methods that have been used describe a clear picture of the relative results. However, inconsistencies in the various methods, isokinetic sampling, laboratory analysis of spent filter earth by weight and drawoff-type samples all point to the same amount of cleanliness but vary somewhat in the amount of dirt in the incoming stream, thus affecting the numerical percentage of contaminates removed. For future information, we hope to perfect a sampling mechanism which will give accurate indications of the dirt in the incoming stream."



SCHEMATIC DIAGRAM of filter-separator-meter assembly at Douglas airport. Entire operation is push-button controlled from fuel-delivery station.

Richfield set this goal: To deliver the cleanest, driest fuel possible with distribution of particulate matter by size to be 5 μ maximum, and filtration should have no adverse effects on the chemical properties of the fuel.

2. Equipment

Discussions with other suppliers and transporters of jet fuels showed that filtration equipment is divided into three main types: (1) expendable cartridge such as shredding vegetable fibers or glass fiber; (2) nonexpendable cartridge such as ceramics or cindered metal; and (3) expendable filter aids such as diatomaceous earth.

Each type was examined in terms of the following characteristics and how they suited Richfield's particular problem:

1. Dependability, as shown by the maximum size of particle that could possibly be allowed to pass under any condition. Also, as proven by existing satisfactory installations.
2. Consistent degree of filtration as indicated by particulate size in the filter discharge stream.
3. Ability to give consistently high-quality filtration over a wide range of dirt loadings in the incoming stream.
4. Degree of automation possible.
5. Cost, with specific attention given to the operating and maintenance costs.

Richfield decided diatomaceous-earth filters would have the greatest potential in the filtration for jet fuel as a central filter. In addition to the characteristics common to all filter installations, this particular job entailed several extra problems that complicated the selection of filtration equipment. First, the jet fuel would be pumped through 4-plus miles of pipelines.

From results obtained while circulating this pipeline, Richfield anticipated high solids loading from the incoming stream. Toward the end of circulating, the solids measured 2,500 mg. per gal. The use of nonexpendable cartridges seemed to be prohibitively expensive. Effective and expendable cartridges costs also would be high. The costs of cartridges for large amounts of solids would require additional costs for the changes. The low cost of diatomaceous earth and the ease of replacement was appealing.

Richfield owns and operates the filter unit. It is located on Douglas property inside its plant gates close beside the DC-8 flight line. Continual 24-hour access to the filter unit for Richfield personnel, while possible, would be bothersome, and the operating expense would be excessive.

After investigating various self-cleaning diatomaceous - earth - type strainers, Richfield decided upon one that could be cleaned automatically. Also, the basket in this strainer that holds the diatomaceous earth in place could be furnished at a mesh size limiting the largest particle that could possibly pass through to be no larger than 30 μ. While particles of this size are much larger than desired, this was an excellent safety feature.

As a safety feature and to assure positive water removal, a cartridge - type coalescing filter was placed downstream of the diatomaceous-earth filter. Although operating data by others indicated that diatomaceous earth is effective in water removal, no positive tests or guarantees were sufficiently advanced at that time to justify the use of the diatomaceous earth as

The entire cleaning operations are controlled by a cam timer.

the sole water-removal equipment.

Also, Richfield felt in case of mechanical failure or screen rupture that the cartridge-type filter would provide a sure safety measure. The cartridge would be located in a normally clean stream if no trouble was experienced and would need replacement at very extended intervals. After 7 months of operation, the pressure losses through those original cartridges remain the same as the day the unit was put into operation.

3. System of Automation

The entire operation is controlled by Douglas fuel loaders with a simple start-stop push button located at the fuel-delivery station.

When the fuel is required, the manual operation of the push button starts and continues the fuel-shipping process from Hynes to Douglas until the stop button is energized. No other manual function is required to operate the system. Each component within the system is automatically controlled and trouble supervised. The failure of any one device will deenergize and make it completely inoperative.

Visual indication of this condition is provided so that the operator may notify maintenance personnel through the dispatching system for immediate action. Memory devices were installed within the system to pinpoint trouble locations. Maintenance personnel can act with this information and efficiently repair the equipment with a minimum of down time.

The strainer. The 400-mesh monel basket is of dutch twill design and is the heart of the strainer vessel.

Fluid enters the unit through the screen and continues out the top of the vessel. The basket contains a coating of diatomaceous earth which filters the jet fuel. Contaminate matter builds up on the interface of the diatomaceous earth as the fuel passes through the basket. To eliminate the fast buildup or a large pressure drop across the strainer, diatomaceous earth is injected into the jet-fuel stream before the strainer. The porous diatomaceous earth packs itself around the foreign particles built up on the filtering surface, thereby retarding high-pressure differential.

When the delivery is complete the strainer is drained and jetted with high-velocity nozzles of clean product. This prepares the strainer for another fuel delivery. In the event of a high-pressure buildup across the strainer, the system will automatically drain and clean itself and continue its cycle.

All cycling operations in the filtering system are automatic. There are three cycles: The starting cycle which prepares the strainer to take fuel; the fueling cycle; and the cleaning cycle which prepares the strainer for another delivery.

Here's how they operate:

... The starting cycle takes 5 minutes and 15 seconds before fuel starts moving through the strainer. Once this cycle starts, filling valves open and 15 seconds later clean fuel from a fill tank is pumped into the strainer. The filling process continues until a 20-g.p.m. flow switch in the strainer overhead line is energized, indicating the strainer is filled.

The filling valve closes and the first of two precoating processes begins. The first precoating process lasts 4 minutes. Diatomaceous earth is injected into the clean fuel, which is circulated through the strainer. This builds up a coating inside the monel basket and forms a filter aid. A dashpot timing relay initiates a finer diatomaceous-earth injection and the second precoating of the strainer begins. This second precoating lasts 1 minute.

After this second precoating, a timing relay opens the inlet and discharge valves and starts the fuel moving from the Hynes tank farm.

All relays within the starting cycle are automatically reset with loss of power. This assures starting at the beginning of the fill cycle.

... The fueling cycle lasts varying amounts of time depending on the amount of fuel involved. Fueling can be controlled either by a stop button or automatically. The system is designed to automatically fill one of the two 25,000-gal. tanks at the Douglas plant. However, if both are filled, the flow must be manually switched from one to the other.

Before going into the underground tanks, the fuel is metered by positive-displacement meters.

... The cleaning cycle as now set up at the Douglas plant takes 8 minutes and 30 seconds, but this is considerably more time than required.

The entire cleaning operations are controlled by a cam timer. A 1-minute dead band is provided before starting the cleaning cycle to allow time for all pumps to stop and for the pneumatically operated time-delay solenoid valves to close (a 30-second valve closure on the system inlet is required to eliminate shock waves).

After 1 minute, drain and vent valves open and remain open for 5 minutes. This is considerably more time than needed and Richfield plans to cut this time in the future. The draining cycle is followed by a jetting cycle which lasts 1½ minutes. A 200-psi. centrifugal pump forces jet fuel through the jetting nozzles, automatically cleaning the monel basket. An additional ¾-minute dead band follows, permitting complete drainage.

The drain and vent valves then close and the timer resets the starting circuit to prepare the strainer for another operation.

Proper cleaning of the strainer is assured since the cam timer does not reset automatically. A stop condition forces the cam timer to proceed through its entire cleaning operation before resetting the starting circuits.

A system control panel at the fuel strainer controls all fueling operations. Lights indicate pump and strainer availability and operating condition. A failure of a component within the fueling system is on the panel by illuminated pilot light showing the pump or strainer as being out of service.

Standby, cycling, and on conditions are also indicated.

A control center is located some distance from the strainer. Within this cabinet are located all relays, motor starters, tone-signaling, and

All alarms operate on "normally closed" field contacts.

telemetering equipment. The cabinet is available only to maintenance personnel.

The control center contains indicating lights to show all pump and valve positions along with process operation. All equipment may be manually operated from the center. A tel-alarm panel located within the control center monitors the process. Any abnormal condition within the system is displayed on the panel. The abnormal condition automatically will shut the unit down until the trouble has been corrected.

A single leased telephone line provides communication between the Hynes tank farm and Douglas Aircraft. Tone-signaling equipment channels information between the two sites. The pump-starting signal, availability, and running conditions are transmitted over this line along with the telemetered flow information.

To prevent damage caused by major line leaks, an automatic pipeline supervisory system has been installed to stop pumping operations if a leak should occur.

The heart of the leak-detection system is a flow recorder-controller. This device compares the flow rates at both ends of the pipeline and transmits an error signal equivalent to the per cent leakage. The error signal shuts down the entire pumping operations until corrective measures have been taken. All elements in the system are designed for fail-safe operation. Component failure will be indicated as a line break.

4. Control and Electrical Detail.

The power distribution panel is fed with a 100-amp. 440-volt, three-phase supply. Within the distribution panel is located a 5-kva., 440/220/110-volt, single-phase control transformer. This transformer supplies voltage to a 10-circuit, circuit-breaker, panelboard which distributes power to all solenoid valves, relays, and miscellaneous control devices.

Also, within the distribution panel are nine combination magnetic line starters for motor control. Each starter operates a fully explosionproof, 440-volt, three-phase motor. The explosionproof feature of the motors was required to meet the California electrical standards governing hazardous locations. All equipment on the strainer skid is fully explosionproof, while the control equipment within the distribution panel, 60 ft. away from the fuel-loading area, is general purpose, weather - resistant equipment.

All motors including the fractional-horsepower are 440-volt to minimize the control transformer size. The 110-volt control voltage was selected from a safety standpoint. A 110-volt circuit can be maintained with a lesser amount of risk to the electrician and still supply all of the control power necessary to operate the system. A control voltage lower than 110 volts would require an excessive current rating on relay contacts and was hence ruled out.

A supervisory alarm system was installed within the equipment to sense a malfunction and stop operation until the problem can be corrected. Another feature of the alarm system is visual indication of the type of failure. A tel-alarm annunciator panel was selected to do this job.

The tel-alarm panel is a semi-modular constructed unit. Each alarm is packaged in a hermetically sealed can and plugs into the indicator panel. The indicating panel consists of 10 alarms. Each alarm is made up of a red and white indicating light. During normal operating condition both lights appear dim. If trouble is sensed within the system, both indicating lights appear bright and the system is automatically stopped.

The strainer remains in the stopped condition until the alarm condition is acknowledged by depressing a reset button. If the alarm condition was a temporary transient, such as a high-pressure shock wave, the alarm panel will reset and the system will again be available to operate. An alarm condition which continues to exist after acknowledgment will be indicated on the panel with a bright red light and a dim white light. The alarm will clear automatically when the abnormal condition is corrected.

All alarms operate on "normally closed" field contacts. This was required in order to maintain a fail-safe design. Eleven pressure switches, seven level controls, nine motor overload relays, and an undervoltage sensing relay make up the complete field trouble sensing elements. It was felt that many malfunction-protection schemes fall short due to the complexity of the transducer. For this reason all levels, pressures, and voltages are directly measured to provide a simple, straightforward protection system.

No audible alarm is provided since visual indications are considered sufficient on this system.

The Hynes control panel contains telemetering equipment to start and stop the Hynes pump and monitor the flow rates at Hynes and Douglas.

Pumpers may manually control the pump to transfer products within the Hynes tank farm. When product transfer is not taking place, a selector switch is placed in the "Douglas control" position. All that is required for Douglas to start the pump is to transmit a 1,050-c.p.s. tone over the Hynes-Douglas telephone line.

When the pump is running, a contact with the pump motor magnetic contactor closes, energizing a 1,450-c.p.s. tone which is transmitted over telephone lines to inform Douglas of the pump's operation. A third tone of 1,250 c.p.s. is transmitted to Douglas when the pump is available to operate, and a fourth tone of 1,650 c.p.s. is transmitted when the leak-detection system indicates a break in the pipeline.

To eliminate siphoning during a line break, a time-delay solenoid valve has been installed on the discharge line of the Hynes pump. It opens when the pump motor starts and closes within 1 minute after the motor stops.

A pressure switch has been installed on the discharge of the pump for low-flow protection. If valves at Douglas do not open within 1 minute after the pump has been in operation, the pressure switch shuts down the pump. This prevents excessive cavitation and overheating.

40. Performance and ultimate oil recovery of a depletion-type pool

. . . by the Schilthuis material-balance approach

BY E. T. GUERRERO

GIVEN: Production tests and history data show that a reservoir is of constant-volume type (no gas cap or water encroachment). It is also known that it was saturated at initial reservoir pressure of 2,500 psia. and temperature of 180° F.

Using the volumetric approach the initial oil in place was found to be 56×10^6 st. tk. bbl. The average water saturation for the pool was 20% and the relationship between the average permeability ratio and total liquid saturation is shown by Fig. 1. Other basic fluid-property data are shown in the first seven columns of Table 1.

FIND: Performance and ultimate oil recovery for this reservoir.

METHOD OF SOLUTION:

Schilthuis form of the material balance equation for a depletion-type pool is as follows:

$$N = \frac{N_p [B_t + B_g (R_p - R_{sb})]}{B_t - B_{ob}} \quad (1)$$

In addition to this equation two others are required;[3] the instantaneous gas-oil-ratio equation:

$$R_i = R_s + \frac{k_g}{k_o} \frac{\mu_o}{\mu_g} \frac{B_o}{B_g} \quad (2)$$

and the total liquid-saturation equation:

$$S_L = S_w + (1.00 - S_w) \times [(N - N_p)/N] (B_o/B_{ob}) \quad (3)$$

bols,[2] and

where N, N_p, B_t, B_g, R_p, R_s, B_o, k_g, k_o, μ_o, μ_g, and S_w are AIME symbols,[2] and

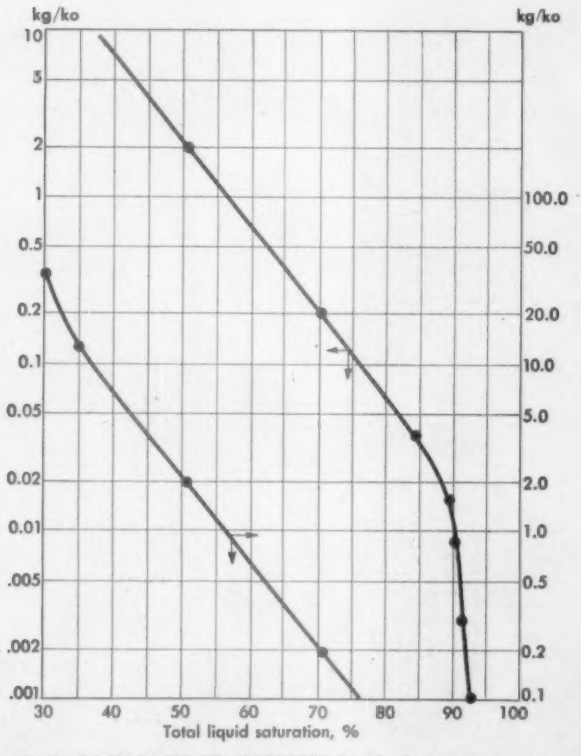
R_i = instantaneous gas-oil ratio, s.c.f. per st. tk. bbl.

S_L = total liquid saturation, fraction of pore volume.

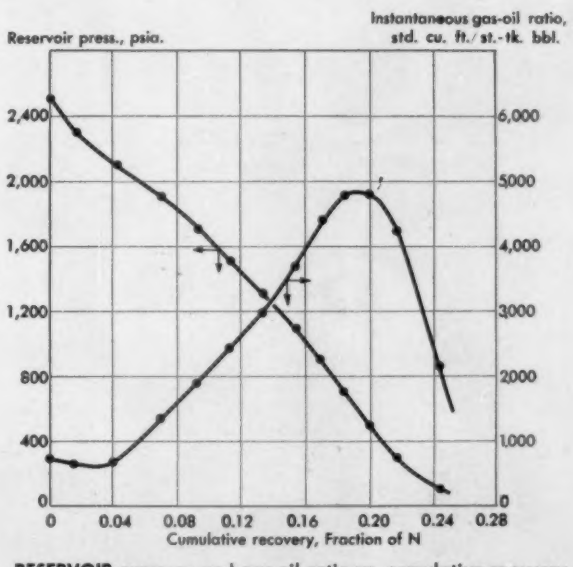
b = subscript indicating bubble point.

SOLUTION: Finding performance and ultimate oil recovery with Equations 1, 2, and 3 involves a trial-and-error procedure. In these computations it is convenient to use Equation 1 in a modified form obtained by dividing each side by N or:

$$1.000 = \frac{(N_p/N) [B_t + B_g (R_p - R_{sb})]}{B_t - B_{ob}} \quad (4)$$



PERMEABILITY-RATIO RELATIONSHIP for depletion-type reservoir. Fig. 1.



RESERVOIR pressure and gas-oil ratio vs. cumulative recovery in depletion-drive performance.

Equation 3 can also be modified to a more convenient form:

$$S_L = S_w + (1.00 - S_w) \times \frac{(N - N_p)/N}{N/N} \times \frac{B_o}{B_{ob}}$$

or

$$S_L = S_w + (1.00 - S_w) \times \frac{1.000 - (N_p/N)}{B_{ob}} \times B_o \quad (5)$$

Calculations involve the solution of Equation 4 at each reservoir pressure of interest. When correct data are used in Equation 4 for a certain pressure, the right-hand side will compute to be 1.0. Actually, in this equation all the data are known for a particular pressure except N_p/N and R_p.

An accepted computation procedure is as follows:

1. Estimate the incremental oil production ($\Delta N_p/N$) for a small drop in pressure (Δp = 200 psi. in this problem).

2. Compute the cumulative oil production to pressure $p_n = p_{n-1} - \Delta p$ by summing all incremental oil productions, or:

$$N_p/N = (1/N) \sum_{i=1}^{i=n} (\Delta N_p)_i \quad (6)$$

3. Solve Equation 5 for S_L at the reservoir pressure p_n of interest.

4. Obtain k_g/k_o corresponding to S_L using the permeability-ratio plot, Fig. 1, and solve Equation 2 for $R_{i\,n}$ at pressure p_n.

5. Compute the incremental gas production (ΔG_p) from:

$$\frac{\Delta G_p}{N} = \frac{\Delta N_p}{N} R_{i\,av} \quad (8)$$

where

$$R_{i\,av} = \frac{R_{i\,(n-1)} + R_{i\,n}}{2} \quad (9)$$

6. Find cumulative gas production to pressure p_n using:

Table 1-Basic data and calculation of performance and reserves

$N = 56 \times 10^6$ STOB, $S_w = 0.20$, $W_p = 0$, $W_e = 0$

BASIC DATA						
(1) p, psia.	(2) B_o	(3) R_s s.c.f./st. tk. bbl.	(4) $B_g \times 10^3$ bbl./s.c.f.	(5) μ_o, cp.	(6) μ_g, cp.	(7) B_t
2,500	1.498	721	1.048	0.488	0.0170	1.498
2,300	1.463	669	1.155	0.539	0.0166	1.523
2,100	1.429	617	1.280	0.595	0.0162	1.562
1,900	1.395	565	1.440	0.658	0.0158	1.620
1,700	1.361	513	1.634	0.726	0.0154	1.701
1,500	1.327	461	1.884	0.802	0.0150	1.817
1,300	1.292	409	2.206	0.887	0.0146	1.967
1,100	1.258	357	2.654	0.981	0.0142	2.251
900	1.224	305	3.300	1.085	0.0138	2.597
700	1.190	253	4.315	1.199	0.0134	3.209
500	1.156	201	6.163	1.324	0.0130	4.361
300	1.121	149	10.469	1.464	0.0126	7.109
100	1.087	97	32.032	1.617	0.0122	21.075

$R_i = R_s + (k_g/k_o)(\mu_o/\mu_g)(B_o/B_g)$

(16) k_g/k_o from Fig. 1	(17) B_o/B_g (2)/(4)	(18) μ_o/μ_g (5)/(6)	(18) $(\mu_o/\mu_g)(B_o/B_g)$ (k_g/k_o) (18)×(17)×(16)	(20) R_i R_s + (19) s.c.f./st. tk bbl.	(21) $R_{i\,av}$ $\frac{R_{i\,n} + R_{i\,(n-1)}}{2}$ s.c.f./st. tk bbl.	(22) Gas production ΔG_p (8) × (21)	(23) ÷ N G_p Σ (22)
0	1,429.4	28.706	0	721	....	.....	.....
0	1,266.7	32.470	0	669	695	11.676	11.676
0.001	1,116.4	36.728	41	658	664	17.198	28.874
0.020	968.8	41.646	807	1,372	1,015	27.913	56.787
0.035	832.9	47.143	1,374	1,887	1,630	37.653	94.440
0.051	704.4	53.467	1,921	2,382	2,135	45.903	140.343
0.072	585.7	60.753	2,562	2,971	2,677	49.525	189.868
0.102	474.0	69.085	3,340	3,697	3,334	73.348	263.216
0.140	370.9	78.623	4,083	4,388	4,043	59.836	323.052
0.183	275.8	89.478	4,516	4,769	4,579	68.685	391.737
0.240	187.6	101.846	4,585	4,786	4,778	74.059	465.796
0.327	107.1	116.190	4,069	4,218	4,502	79.235	545.031
0.456	33.9	132.541	2,049	2,146	3,182	81.141	626.172

$$G_p/N = (1/N) \sum_{i=1}^{i=n} (\Delta G_p)_i \quad (10)$$

7. Solve for R_p at p_n with the equation that defines this variable:

$$R_p = \frac{G_p/N}{N_p/N} \quad (11)$$

8. Using the N_p/N of step 2 and R_p of step 7 solve Equation 4. If the right-hand side does not equal 1.0, estimate another value for ΔN_p and repeat the entire procedure. The trial - and - error procedure is continued until the solution of Equation 4 yields 1.0.

For example, if p_n = 1,700 psia., assume $\Delta N_p/N = 0.0231$ for Δ_p = 200 psi. between 1,900 and 1,700 psia.

Thus, $N_p/N = 0.0168 + 0.0259 + 0.0275 + 0.0231 = 0.0933$.

$$S_L = 0.20 + (1.00 - 0.20) \times \frac{1.0000 - 0.0933}{1.498} \times 1.361$$

$$S_L = 0.20 + 0.80 \times \frac{0.9067}{1.498} \times 1.361 = 0.200 + 0.659 = 0.859$$

From Fig. 1, $k_g/k_o = 0.035$ and:

$$R_i = 513 + (0.035) \times \frac{1.361}{0.001634} \times \frac{0.726}{0.0154} = 1,887 \text{ s.c.f./st. tk. bbl.}$$

$$R_{i\,av} = \frac{1,372 + 1,887}{2} = 1,630 \text{ s.c.f./st. tk. bbl.}$$

$$\Delta G_p/N = (0.0231)\ (1,630) = 37.653$$

$$G_p/N = 11.675 + 17.198 + 27.913 + 37.653 = 94.440$$

for a depletion-type pool using Schilthuis material-balance approach

$$S_L = S_w\,(1.00 - S_w)\,[1.00 - (N_p/N)]\,(B_o/B_{ob})$$

(8) Recovery, fraction of initial in place, N		(10)	(11)	(12)	(13)	(14)	(15)
ΔN_p	N_p	$\frac{N - N_p}{N}$ 1.00 − (9)	$\frac{N - N_p}{N}$ 1.00	B_o/B_{ob} (2)/B_{ob}	$\frac{N-N_p}{N} \times \frac{B_o}{B_{ob}}$ (11) × (12)	$\frac{N-N_p}{N} \times \frac{B_o}{B_{ob}} \times (1.00 - S_w)$ (13) (0.80)	S_L 0.20 + (14)
0.0168	0.0168	1.0000	1.0000	1.000	1.000	0.800	1.000
0	0	0.9832	0.9832	0.977	0.961	0.769	0.969
0.0259	0.0427	0.09573	0.9573	0.954	0.913	0.730	0.930
0.0275	0.0702	0.9298	0.9298	0.931	0.866	0.693	0.893
0.0231	0.0933	0.9067	0.9067	0.909	0.824	0.659	0.859
0.0215	0.1148	0.8852	0.8852	0.886	0.784	0.627	0.827
0.0185	0.1333	0.8667	0.8667	0.862	0.747	0.598	0.798
0.0220	0.1553	0.8447	0.8447	0.840	0.710	0.568	0.768
0.0148	0.1701	0.8299	0.8299	0.817	0.678	0.542	0.742
0.0150	0.1851	0.8149	0.8149	0.794	0.647	0.518	0.718
0.0155	0.2006	0.7994	0.7994	0.772	0.617	0.494	0.694
0.0176	0.2182	0.7818	0.7818	0.748	0.585	0.468	0.668
0.0255	0.2437	0.7563	0.7563	0.726	0.549	0.439	0.639

$$1.000 = \frac{(N_p/N)\,[B_t + B_g\,(R_p - R_{sb})]}{B_t - B_{ob}}$$

(24) R_p G_p/N_p s.c.f./st. tk bbl.	(25) $R_p - R_{sb}$ (24) − 721 s.c.f./st. tk bbl.	(26) $B_g\,(R_p - R_{sb})$ (4) × (25)	(27) $B_t + B_g$ × $(R_p - R_{sb})$	(28) N_p × (27)	(29) $B_t - B_{ob}$ B_t − 1.498 (7) − 1.498	(30) N (28) ÷ (29) = 1.000	(31) Cumulative recovery N_p, bbl. (9) × 56 × 10^6
....	....	.....	....	.....	.....	....	.....
695	−26	−0.030	1.493	0.02508	0.025	1.003	940,800
676	−45	−0.058	1.504	0.06422	0.064	1.003	2,391,200
809	88	0.127	1.747	0.12264	0.122	1.005	3,931,200
1,012	291	0.475	2.176	0.20302	0.203	1.000	5,224,800
1,223	502	0.946	2.763	0.31719	0.319	0.994	6,428,800
1,424	703	1.551	3.518	0.46895	0.469	1.000	7,464,800
1,695	974	2.585	4.836	0.75103	0.753	0.997	8,696,800
1,899	1,178	3.887	6.484	1.10293	1.099	1.004	9,525,600
2,116	1,395	6.019	9.228	1.70810	1.711	0.998	10,365,600
2,322	1,601	9.867	14.228	2.85414	2.863	0.997	11,233,600
2,498	1,777	18.603	25.712	5.61036	5.611	1.000	12,219,200
2,569	1,848	59.195	80.270	19.56180	19.577	0.999	13,647,200

$$R_p = \frac{94.440}{0.0933} = 1{,}012 \text{ s.c.f./st. tk. bbl.}$$

$$1.000 = \frac{0.0933\ [1.701 + 0.001634\ (1{,}012 - 721)]}{1.701 - 1.498}$$

$$= \frac{(0.0933)\ (2.176)}{0.203} = 1.000$$

DISCUSSION: Performance of oil-producing reservoirs is determined mostly by the nature of the energy available for moving the oil to the well bores. It is influenced also by the way existing energy is used during the production history. These controlling factors in turn depend on several variables such as reservoir structural conditions, nature of the oil, gas in solution, flow capacity of the rock, mobility of contiguous aquifers, if present, and rates of oil, gas, and water withdrawal.[4]

Principal natural energies are (1) expansion of oil, water, and rock, (2) force of gravity, (3) expansion of gas coming out of solution, (4) expansion of initially free gas, and (5) expansion of waters in reservoirs that are in communication with the oil column. In actual practice conditions are never such that an oil reservoir can be described throughout its life by any single type of producing mechanism. Very often, however, one of the natural types of energy will predominate and control the performance of a pool.

Energy for a depletion-type drive comes from gas dissolved in the oil. It is made available as this gas comes out of solution and expands in place, or flows to low-pressure regions surrounding the producing wells.[4] As pressure declines, more gas comes from solution and expands with previously evolved gas. Then an equivalent volume of oil and gas is expected from the rock into the well bores.

The solution of this problem involves the material-balance equation for a depletion-type reservoir, (Equation 1) the instantaneous gas-oil-ratio equation, (Equation 2) and the liquid saturation equation, (Equation 3). While the basic principles involved in these equations are well understood, we need to introduce simplifications in their application. These include the assumptions of (1) reservoir uniformity, (2) neglect of the localization of actual fluid withdrawals through well bores, and (3) neglect of the effect of gravity in inducing fluid segregation and downstructure gravity drainage of the oil.[4] In addition, it is assumed that the pool in question is one deriving its energy principally from expansion of gas initially in solution. This can best be established with production tests, and pressure and production history.

Table 1 shows the basic data and calculated results for performance and reserves of the pool in question. Note that the first seven columns give the necessary pressure and fluid property data. In addition to this, the permeability-ratio relationship for this pool is given in Fig. 1.

A major portion of the work involved in solving problems of this nature is consumed in the collection, analysis, and evaluation of the basic data. It should be obvious that the results depend, to a large degree, on the use of average rock and fluid-property data as well as reservoir-pressure data. Note that columns 8 through 15 are a solution of Equation 5; columns 16 through 20, a solution of Equation 2; and columns 25 through 30, a solution of Equation 4.

Note that Equation 9 adds an assumption to those listed above. Here it is assumed that the producing gas-oil ratio varies linearly throughout a pressure increment. This assumption simplifies the computation of produced gas and cumulative gas-oil ratio. Note in column 30 that the trial-and-error procedure is continued until the incremental recovery, ΔN_p, satisfies Equation 4 to an accuracy of $\pm 1\%$.[3] Only the best-fitting values are shown in Table 1. Normally it takes from three to four estimates of the incremental production to satisfy Equation 4 to the accuracy desired.

Columns 8 and 9 of Table 1 show the incremental and cumulative recoveries expressed as fractions of initial oil in place. Values in column 9 have been converted to cumulative recovery in stock-tank barrels in column 31. Note in column 9 that the cumulative oil recovery to a pressure of 300 psi. is about 22% of the initial oil in place. Such a cumulative recovery is representative of recoveries obtained in depletion-type pools.

This problem has shown that the Schilthuis form of the material-balance equation can conveniently be used for a trial-and-error solution of depletion-drive problems. The method is flexible and can be easily modified for special applications. The same cannot be as readily done with the Tarner approach[5] and the Muskat method,[4] particularly when gravity segregation occurs simultaneously with the depletion process, and when considering the effect of gas injection and cycling under the assumption that only part of the reservoir rock is contacted by the injected gas.[3]

The final results of the problem are plotted in Fig. 2. Shown are reservoir pressure and gas-oil ratio vs. cumulative recovery. In spite of the drastic assumptions made in the solution of the equations, these graphs show typical depletion-drive behavior. The reservoir pressure declines rather rapidly while the gas-oil ratio remains fairly constant in the initial stages and then rises rapidly to a peak. When most of the gas has been produced the gas-oil ratio declines rapidly.

Reservoir performance here has been related to reservoir pressure. In a subsequent problem it will be related to the more desirable parameter of time. Generally the computations involved in the solution of this problem are rather tedious, but this type of problem can easily be adapted to an electronic computer.

References

1. Schilthuis, R. J., "Active Oil and Reservoir Energy": Trans. AIME, (1936) 118, 33.
2. "Standard Letter Symbols for Petroleum Reservoir Engineering and Electric Logging": Journal of Petroleum Technology, (Oct. 1956).
3. Pirson, S. J., "Oil Reservoir Engineering": McGraw-Hill Book Co., second edition, 1958.
4. Muskat, M., "Physical Principles of Oil Production": McGraw-Hill Book Co., first edition, 1949.
5. Tarner, J., "How Different Size Gas Caps and Pressure-Maintenance Programs Affect Amount of Recoverable Oil": Oil Weekly, June 12, 1944.

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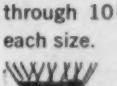

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- low-volatility oil
- catalyst-bed temperature not lower than 600° F.
- bed of catalyst in regenerator deep enough to cover the torch-oil nozzle by several feet
- means to check whether the oil has ignited, so that flow can be cut off if it has not.

BY WILLIAM L. BULKLEY
Research & Development Department, American Oil Co., Whiting, Ind.

ADDING TORCH OIL to the regenerator is risky if it is improperly done.

Burning this oil in the regenerator not only cuts startup time by heating the vessel and catalyst more rapidly; it also permits higher temperatures than could be obtained readily with an air heater alone. In units that depend upon catalyst to seal cyclone dip legs, rapid heating cuts catalyst losses since an adequate catalyst bed can be built up early.

These are the practical reasons for using it. However, bringing a hydrocarbon into an air-filled pressure vessel violates conventional principles of process safety.

The principal hazard to the regenerator is that a flammable air-hydrocarbon mixture may accumulate in the vessel. If this mixture is ignited, it will explode. The severity of the explosion depends on the volume of the mixture.

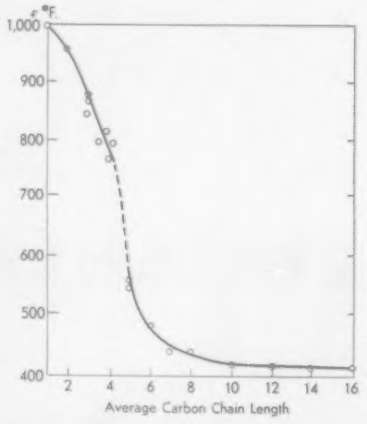
A flammable mixture can only be avoided by promptly igniting the torch oil as it enters the vessel. This fact is generally recognized, but the measures taken to avoid the hazard vary with individual refiners. However, you can develop adequate precautions by considering these factors: properties of the oil, vessel temperature, and the presence of catalyst.

Oil properties. The temperature of the regenerator and its contents is the sole cause of ignition for the torch oil. Positive and rapid ignition requires this temperature to be far enough above the spontaneous-ignition temperature of the oil to avoid delay. In this respect, the properties of the oil define the safe regenerator temperature at the time oil flow is started.

The oil used as torch oil varies among refiners and even within a refinery. However, it usually has properties like those in Table 1. Because ignition temperatures have not been determined for specific torch oils, estimates must be used, and liberal safety factors are advisable in applying these estimates to refinery operations.

TABLE 1—PROPERTIES OF A TYPICAL TORCH OIL

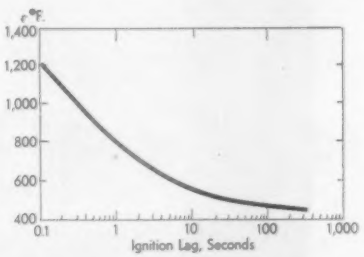
Gravity, °API	10
Carbon-to-hydrogen ratio	6.3:1
Distillation, °F.:	
Initial	400
10%	600
30%	700



MINIMUM spontaneous-ignition temperature depends upon the length of the hydrocarbon chain. Fig. 1.

Minimum spontaneous-ignition temperature is defined as the lowest surface temperature that will ignite a combustible in the test apparatus. The most favorable concentration of the combustible in air is obtained by varying the composition to determine the minimum ignition temperatures. Within these experimental limits, minimum spontaneous-ignition temperature is a function of hydrocarbon-chain length[3] as shown in Fig. 1. Chain length is calculated with consideration of side chains, cyclic structures, and other molecular arrangements. However, the flat portion of the curve above hydrocarbons equivalent to C_8 shows that torch oils have ignition temperatures below 500° F.

Minimum ignition temperatures are associated with ignition delay. Fig. 2 shows the magnitude of ignition lag for JP-4 jet fuel, one of the few stocks for which data are available over a range of variables.[2] There are several minutes of ignition lag at the minimum tempera-



MINIMUM ignition temperature can be correlated with ignition delay. This curve is for JP-4 jet fuel. Temperature chosen should be high enough that the oil will ignite rapidly. Fig. 2.

The new Crown Central Petroleum Corporation DETOL plant at Pasadena, Texas

Crown Central 17-million gal/yr benzene plant using DETOL Process now on stream

The Houdry DETOL Process is now producing the expected high yields of better than nitration grade benzene by the hydrodealkylation of toluene feedstock for Crown Central Petroleum Corporation.

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The Houdry catalyst specifically developed for the DETOL process permits use of relatively moderate temperatures for high conversion of toluene per pass.

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ture. Heavier oils show greater ignition lag than light ones. Hence, a safe minimum temperature for rapid ignition probably should be at least 100° F. above the estimated minimum. For this reason, 600° F. is a practical ignition temperature for torch oil.

Volatility of the torch oil affects safety. Light ends vaporize rapidly at the regenerator temperature and will pass directly to the empty portion of the vessel above the catalyst. Heavy stocks, steam-atomized in the inlet nozzle, can form flammable mists in the air, but flammable mixtures are more readily formed from vapor. The lighter stocks also may have higher ignition temperatures, which increase the risk of a dangerous accumulation of vapor. Several years ago a torch oil of too low boiling range exploded in a regenerator;[1] fortunately, although the explosions were heard outside the refinery, damage was small.

Catalyst bed. Catalyst normally is in the regenerator when torch oil is added. Even as a thin bed, catalyst protects the grid from burning torch oil. Mist or spray from the steam-atomized oil is reduced as some of the oil is absorbed by the bed. The heat capacity and fluid motion of catalyst also minimize local hot spots. More importantly, the extensive surface of the catalyst improves ignition, probably by reducing ignition temperature of the oil.

The role of catalyst in improving ignition has been demonstrated in the laboratory. A small model of a cracker regenerator was maintained at 600° F. by heated air flowing at a rate equivalent to that in a commercial unit. Injection of steam-atomized torch oil into the empty vessel produced pressure surges as large as 50 psi., measured by a Bourdon gage. A more sensitive measurement undoubtedly would have shown higher explosion pressures. However, with a fluidized catalyst bed in the vessel, pressure fluctuated no more than 2 to 3 psi., even with the torch-oil inlet above bed level. Ignition always occurred at the 600° F. temperature. (In a study of another process, the ignition temperature of hydrogen jetting into air at 300 psi. was found to decrease from about 900° F. to less than 500° F. when catalysts or inert dusts dropped through the jet. Thus, catalyst in a cat cracker regenerator may achieve its beneficial effect by decreasing ignition temperature of the oil.

Introducing oil safely requires two things: (1) a minimum temperature high enough to make rapid ignition probable, and (2) catalyst in the regenerator to promote ignition and prevent local overheating. Preferably the catalyst bed is deep enough to cover the oil inlet. This prevents spraying and provides immediate contact between oil and catalyst.

Commercial Practice

A suitable oil introduced into a regenerator with a hot enough catalyst bed should ignite rapidly and smoothly. However, to avoid hazard if the oil does not ignite, a check is needed. The oil flow may then be stopped before too much is added.

An increase in bed temperature indicates that the torch oil has ignited. The time required for a temperature rise to be indicated depends upon the oil flow rate and the location of thermocouples. At a low rate (3 to 5 bbl. per hour), a thermocouple near the oil inlet will respond in 2 to 3 minutes; a thermocouple on the opposite side of the vessel may require 5 minutes. Lack of a temperature indication within these time limits probably means that ignition was delayed or failed to take place. Oil flow can then be stopped and should be restarted only after bed temperature is raised at least 25° F. by air heating.

A low initial oil rate reduces the amount of combustible in the vessel if the oil does not ignite. However, there is a practical lower limit. A very low rate heats the catalyst so slowly that ignition may be difficult to detect with assurance. A rate high enough to provide a rapid temperature rise as evidence of ignition is preferred. Our previous initial rates of 1 to 2 bbl. per hour for a regenerator 36 ft. in inside diameter have been increased to nearly 5 bbl. per hour for this reason.

The several precautions for safe torch-oil addition are recognized to different degrees in the industry.

Table 2 summarizes our revised procedures and the recommendations of three major engineering contractors. Some catalyst is specified in all cases. Submerging the oil inlet to a depth of several feet is preferred.

A temperature of 600° F. is not accepted as a safe minimum by one contractor. Many refiners use 700° F. This higher temperature increases the margin of safety, but air heaters on some units can attain the 700° F. level only after uneconomically long heating. Since operating experience and laboratory tests have shown prompt ignition at 600° F., this temperature is a safe minimum for units that cannot reach higher temperature without undue delay.

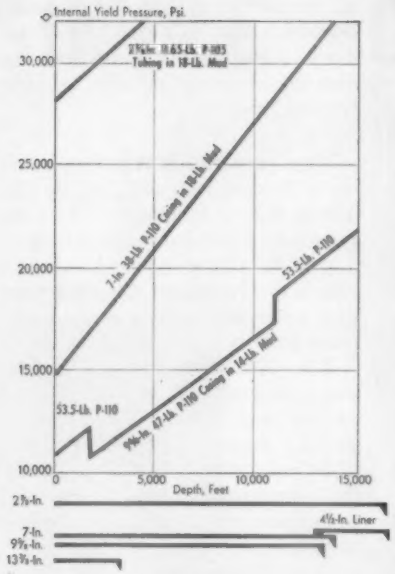
Limiting the initial rate of oil flow and verifying the ignition are not generally specified. However, these other precautions are advisable.

References

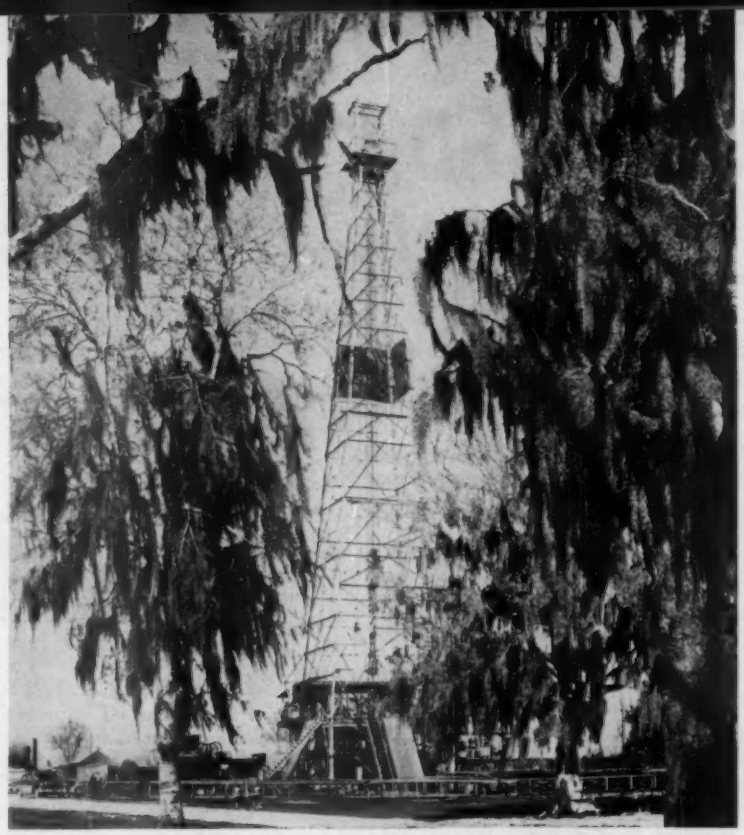
1. Degnen, W. J., and Skelly, J. F.: Paper presented at ASTM Petroleum Mechanical Engineering Conference, September 22, 1952.
2. Jones, G. W., Zabetakis, M. G., Scott, G. S., and Furno, A. L., WADC TR52-35, Wright-Patterson Air Force Base (1952).
3. Zabetakis, M. G., Furno, A. L., and Jones, G. W., Ind. Eng. Chem. 46, 2173 (1954).

TABLE 2—PROCEDURES FOR INTRODUCING TORCH OIL

	Catalyst	Temperature	Other precautions
American Oil Co.	5-6 ft. above torch-oil nozzle.	600° F. minimum	Initial flow: 4.8 bbl. per hour. If torch oil does not ignite in 2-3 minutes (as indicated by temperature rise), shut off oil flow.
Contractor A	Oil inlet definitely covered.	Close to 600° F.	...oil is admitted for a short time and then blocked off. If temperature rises in the vessel, oil is readmitted.
Contractor B	catalyst level reaches torch-oil nozzle.	700° F. minimum	.....
Contractor C	nozzle covered by catalyst to a depth of not less than 2 ft.		.....



DESIGN against burst pressure demands high-strength casing. The 9⅝-in. intermediate string is designed to withstand 10,000 psi. at the surface; all subsequent pipe and wellhead-equipment can withstand 15,000 psi.



SERENITY ON SURFACE belies pressure below for Tidewater location at Hollywood field. Well pictured here is only 100 yards from nearest home; producing wellhead pressure will be in excess of 10,000 psi. Location is on a community lease signed by the city of Houma.

Extreme pressures, town-lot locations necessitate careful operation

Hollywood field at Houma, La., now a major reserve for Tidewater Oil Co., is both a rewarding and demanding operation. Well locations are often quite close to houses and public buildings; wellhead pressures are extremely high. A new oil mud is helping to prevent wall sticking.

BY ED McGHEE
Drilling Editor

TAKE WELLHEAD pressures among the highest ever recorded. Combine these with rig locations close by homes and schools. Add great depths and high costs. Throw in persistent differential-pressure sticking. Sprinkle on a little lost circulation.

That's the recipe for headaches that Tidewater Oil Co. has found in Hollywood field at Houma, La. In response to this demanding set of circumstances, Tidewater's operations there have become models of care and planning for successful Gulf Coast drilling and production.

Being careful, in Tidewater's book, doesn't mean simply making everything heavier and stronger and more closely supervised. It also means adopting new procedures which promote safety and lower costs. The company's latest well in Hollywood field, the 12 Southdown, is an example of willingness to depart from past practice. From 15,100 ft. to total depth of 16,570 ft., Tidewater drilled a 5¾-in. hole with a recently introduced oil mud; the mud was quite successful though never used before under such stringent conditions of great depth, high pressure, high temperature, low clearances, and problem formations.

The well itself was also a big success. It uncovered an impressive 517 ft. of pay in 13 separate sands, 7 of which are new discoveries.

TABLE 1—TYPICAL PROPERTIES OF OIL MUD

Depth, ft.	15,100	15,487	15,978	16,380	16,521
Weight, lb./gal.	17.5	17.7	17.7	17.7	18.0
Viscosity, seconds	74	94	98	104	92
Initial gel, g.	2	0	10	10	8
10 minute gel, g.	15	12	18	20	18
Filtrate, API, ml.	0.0	0.0	0.0	0.0	0.0
Filtrate, 275° F., 500 psi., ml.	3.0	4.8	6.2	5.4	4.6
Average sp. gr., solids	4.2	4.1	4.1	4.2	4.2
Oil/water, vol. %	47/16	46/17	46/16	45/16	46/15

When completed in one of these zones, the well flowed 117 bbl. of condensate and 3,200 M.c.f. of gas per day at a tubing-head pressure of 9,710 psi. Shut-in pressure is 11,920 psi.

Tidewater officials are gratified that this imposing producer was drilled and completed without spectacle; well location is between two schools and near several homes.

Off to impressive start. Tidewater has been drilling Hollywood field since 1953. An early well in the field was the 1 Houma Community, initial wildcat on a lease block assigned to Tidewater by the city of Houma. This project drilled from a site outside the inhabited areas to a bottom-hole target under the city. In doing so, the well set a record as the longest deviated hole ever drilled to that time; deviation was controlled from 1,004 ft. to a measured depth of 14,128 ft. and a vertical depth of 13,550 ft. Bottom of the hole was displaced laterally 3,366 ft. from the surface location.

Tidewater deliberately halted drilling the 1 Houma Community before reaching the Southdown sand; the zone had too much pressure for completion equipment of the day, the company felt. That was in 1954. Since then, a number of completions have been made in the Southdown sand. The most recent well, the 12 Southdown, has found production in several zones deeper and higher in pressure than that sand. Tidewater had no hesitancy about bringing these zones into production.

The growth of confidence on Tidewater's part reflects the general improvement in goods and techniques for handling high pressures.

TABLE 2—OIL-MUD MAINTENANCE MATERIALS USED IN DRILLING 5¾-IN. HOLE FROM 15,100 TO 16,521 FT.

Material—	Quantity
Emulsifier, lb.	6,100
Filtration control agent, lb.	4,900
Barite, bags or sacks	540
Diesel oil, bbl.	159
Fine mica, lb.	4,350
Stabilizer, lb.	1,700

Note: 1,500 bbl. of the oil mud had been premixed and delivered to location while 7-in. liner was being set.

TABLE 3—CASING DESIGN FOR 12 SOUTHDOWN

Size, in.	Length, ft.	Weight, lb./ft.	Grade	Pipe Ends	Connection	Minimum yield strength, burst psi.
20	500	79.6	J-55	Plain	SJ	1,310
13⅜	2,000	54.5	J-55	Regular	8RS	2,730
	1,500	61.0	J-55	Regular	8RS	
	3,500					
9⅝	1,800	53.5	P-110	Regular	8RL	10,900
	9,200	47.0	P-110	Regular	8RL	9,440
	2,490	53.5	P-110	Regular	8RL	10,900
	13,490					
7	14,330	38.0	P-110	Regular	8RL	14,850
2⅞	0 to 10,000	11.65	P-105	Upset	Hydril	28,120
2⅜	10,000 to 16,317	5.95	P-105	Upset	Hydril	19,650
4½ (Liner)	14,174 to 16,570	15.1	P-110	Nonupset	Hydril	14,420
1	9,998	1.8	N-80	Upset	Hydril	14,160

A good way to illustrate the improvements is to follow one of the present-day wells from spudding to total depth. The newly completed 12 Southdown is a good illustration; it reflects not only the best of today's high-pressure practices but also the problems peculiar to Hollywood field.

Most problems at depth. A steam rig of Falcon Seaboard Drilling Co. drilled the 12 Southdown. This rig spudded surface hole and drilled to 3,499 ft. where 13⅜-in. surface pipe was cemented. A native mud with some bentonite was used and there were no unusual problems.

The 12¼-in. intermediate hole was drilled to 8,800 ft. with a lightly treated mud (caustic soda, bentonite, and dispersant). At that depth, it became necessary to weight up the system to offset formation pressures. So, from 8,800 ft. to intermediate-casing point at 13,500 ft., a weighted gyp mud was used. The bit reached 13,500 ft. only 30 days after spudding.

A 13,490-ft. string of 9⅝-in. casing (an extreme length for this size) was run and cemented without incident.

Below the 9⅝-in. pipe, hole size was reduced to 8¾-in. and the same gyp and oil-emulsion mud was continued. When the well reached 14,500 ft. there was a mechanical failure of a downhole tool in the drill string. Result was a fish which proved impossible to wash over. For that reason the hole was sidetracked and drilling continued around the fish.

After sidetracking, there was some trouble with the hole. The drill pipe dragged when being pulled for trips and there were "tight spots" when running back into the hole. There was evidence that the hole was "ripe" for differential-pressure sticking of the drill string.

In spite of the hole trouble, drilling continued at fair speed to 15,100 ft. At this point Tidewater decided to set a 7-in. liner to protect possible producing sands already drilled below the 9⅝-in. intermediate string. As the 7-in. was being run, it stuck with its lower end at 14,328 ft., almost 800 ft. off bottom.

Since mud could be circulated freely through the liner, it was apparent that the 7-in. pipe was wall

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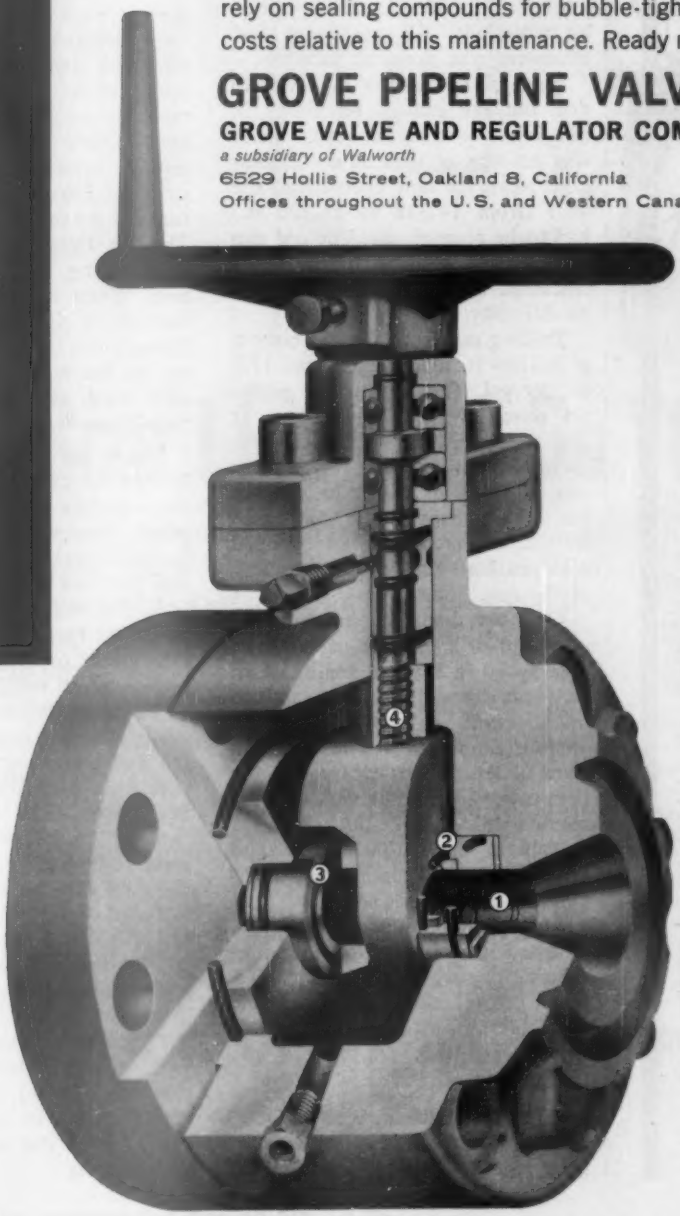

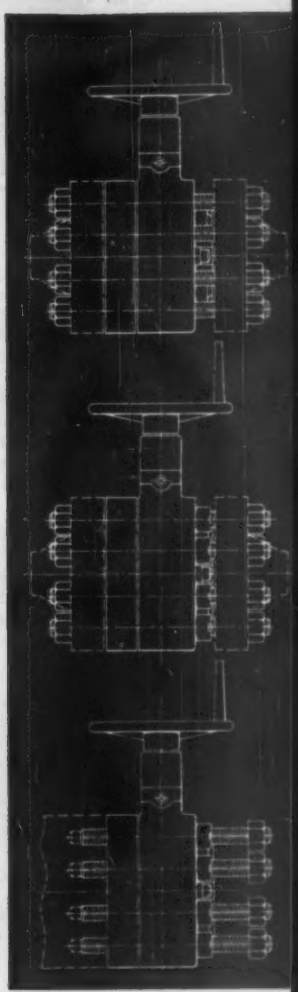

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stuck—differential - pressure stuck. All usual methods failed to free the 7-in. so it was cemented in place.

New mud mixed. Among the measures Tidewater used in its attempts to free the stuck liner was spotting an oil-base emulsion mud in the open hole around the pipe. Later on, the entire hole was filled with the oil mud. By this time, however, the liner had been stuck several days and would not come loose.

After the liner was cemented, Tidewater decided to drill to total depth with the oil mud which is a recent development of Baroid Division, National Lead Co. A total of 1,500 bbl. of the mud was trucked to the location from a nearby bulk plant. All subsequent mud treatment was done on location.

First job of the new mud was to drill out the cement remaining in the 7-in. liner. Afterwards, there was no sign of cement contamination. Next, the hole open below the liner (from 14,328 to 15,100 ft.) had to be reamed out. The old gyp mud remaining in this interval was entrained in the new oil mud with no difficulty.

Drilling out from the old bottom at 15,100 ft. mud weight was 17.5 lb. per gal. The weight was gradualy raised to 18.0 lb. per gal. at final total depth of 16,570 ft. Bottom-hole temperature at that point was 300° F. or more. In spite of the high temperature and high weight, the mud was not troubled with settling of barite or separation of the emulsion.

Only two diamond bits were necessary to drill the 5¾-in.-diameter hole 1,470 ft. to total depth. When well logs showed promising sands in this interval, Tidewater elected to attempt running a 4½-in. liner. In spite of the narrow clearances, the liner went to bottom and was cemented with no difficulty.

Table 1 shows that the oil mud remained in good condition throughout all this work. Moreover, the cost of mud-maintenance materials, as listed in Table 2, was low considering the depth and temperature. Since the oil mud appeared stable and able to suspend its solids, it was later left in the hole as the packer fluid.

Pipe and wellhead. While drilling through the 9⅝-in. casing the wellhead was designed to hold 10,000 psi. Thereafter everything was rated for 15,000 psi.

For drilling, the wellhead was equipped with two Cameron Type F blowout preventers, rated at 15,000-psi. working pressure. Also used was a 10-in. GK Hydril preventer.

Once the 4-in. liner was in place, Tidewater ran a "patch" string of 7-in. casing to complete the string all the way to the surface. This casing was designed to contain full well pressure. Table 3 gives details of the casing strings.

The 9⅝, 7, and 4-in. casing and the tubing strings were all hydrostatically tested and inspected. The 9⅝ and 7-in. strings were inspected over their full length with magnetic-particle equipment; in addition, these strings were inspected internally with optical equipment. The tubing string was also inspected in this manner with additional magnetic-particle inspection on the upset-end areas. The tapered tubing string of 2⅞ and 2⅜-in. pipe was run and set on packer at 16,317 ft. Then, a 10,000-ft. "kill string" of 1-in. tubing was hung out of the tree. When completed, the 12 Southdown flowed 6,200 M.c.f.d. through the 1-in. tubing with 5,970 psi. at the surface. The 1-in. was also used to circulate water to "wash" the well into production.

Watch paraffin, corrosion. After Hollywood field wells are on production, they are produced with relatively little difficulty. Besides taking great care to keep the wellhead and flowline pressures under control, Tidewater's production men have only two potential problems to avoid. One problem common to all high-pressure wells is corrosion.

To make certain that corrosion inhibitor coats every surface down the well, Tidewater regularly pumps chemicals down the tubing string of every well. The inhibitor is "chased" with field distillate completely down the hole and into the formation itself. Thus, when the well flows back, there is some residual of inhibitor to keep a continuous coating for many weeks.

Paraffin could also be a problem if permitted to be. Tidewater avoids the problem by keeping flow temperatures high enough that paraffin does not deposit out either in the tubing string or in the flowlines. Special separator units are used for this purpose.

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Distillation curves show boiling-point characteristics

FOR complete boiling-point characteristics of a liquid mixture, we have to look at a distillation curve for the particular mixture. Examples of these curves for crude oil and gasoline are shown in Figs. 5 and 6. When a single boiling point is given for a mixture, it is given as its volume average boiling point (the average of the temperature for 10, 30, 50, 70, and 90 vol. % vaporized).

Illustrated are the distillation curves for two different crudes both having the same initial and final boiling points (75° and 1,400° F.). However, note that crude "A" is much heavier crude than "B," since its volume average boiling point is 800° F. while that for B is only 650° F.

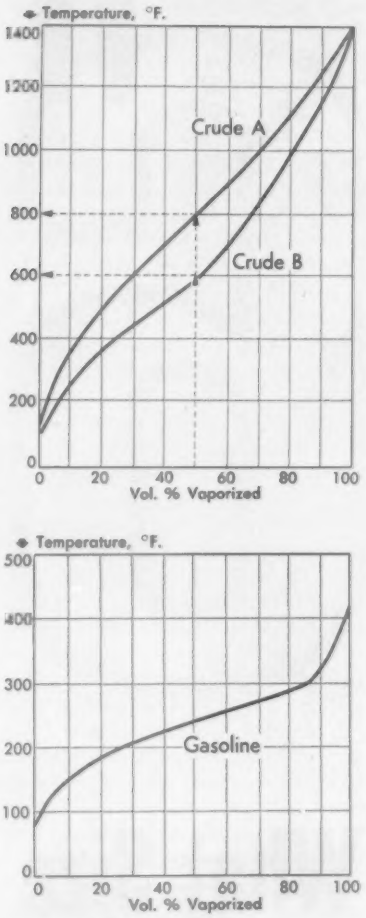
Similar curves can be drawn for the narrower-boiling-range mixtures distilled from the wide-boiling-range crude mixture. An example of one for a gasoline cut is shown in Fig. 6.

Referring to Fig. 5, note that if the gasoline cut (boiling range 75° to 430° F.) were made from crude "A," we would get only 20 bbl. of gasoline from each 100 bbl. of crude (20 vol. % yield). If it were cut from crude "B," we would get about 35 bbl. from each 100 bbl. of crude (35 vol. % yield).

Distillation curves are made up for all of the different types of crude oil. Therefore, we can determine before we run the crude how much of each type of product (based on boiling points) we will get from the crude upon distillation.

Summary

1. Every liquid (pure or mixture) exerts a vapor pressure.



DISTILLATION CURVES show the boiling-point characteristics of a mixture. Figs. 5 and 6.

2. Vapor pressure of a liquid increases with increasing temperatures.

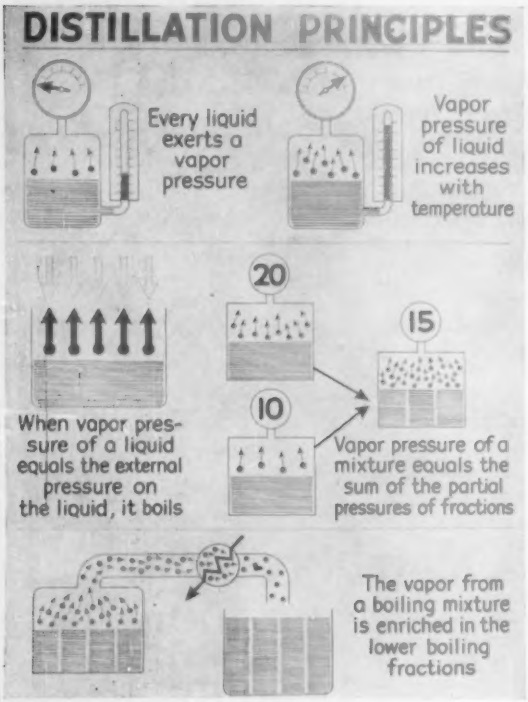
3. With a mixture, the vapor pressure exerted equals the sum of the partial vapor pressures exerted by each of the pure components in the mixture.

4. When the vapor pressure of a liquid equals the external pressure on the liquid, the liquid begins to boil.

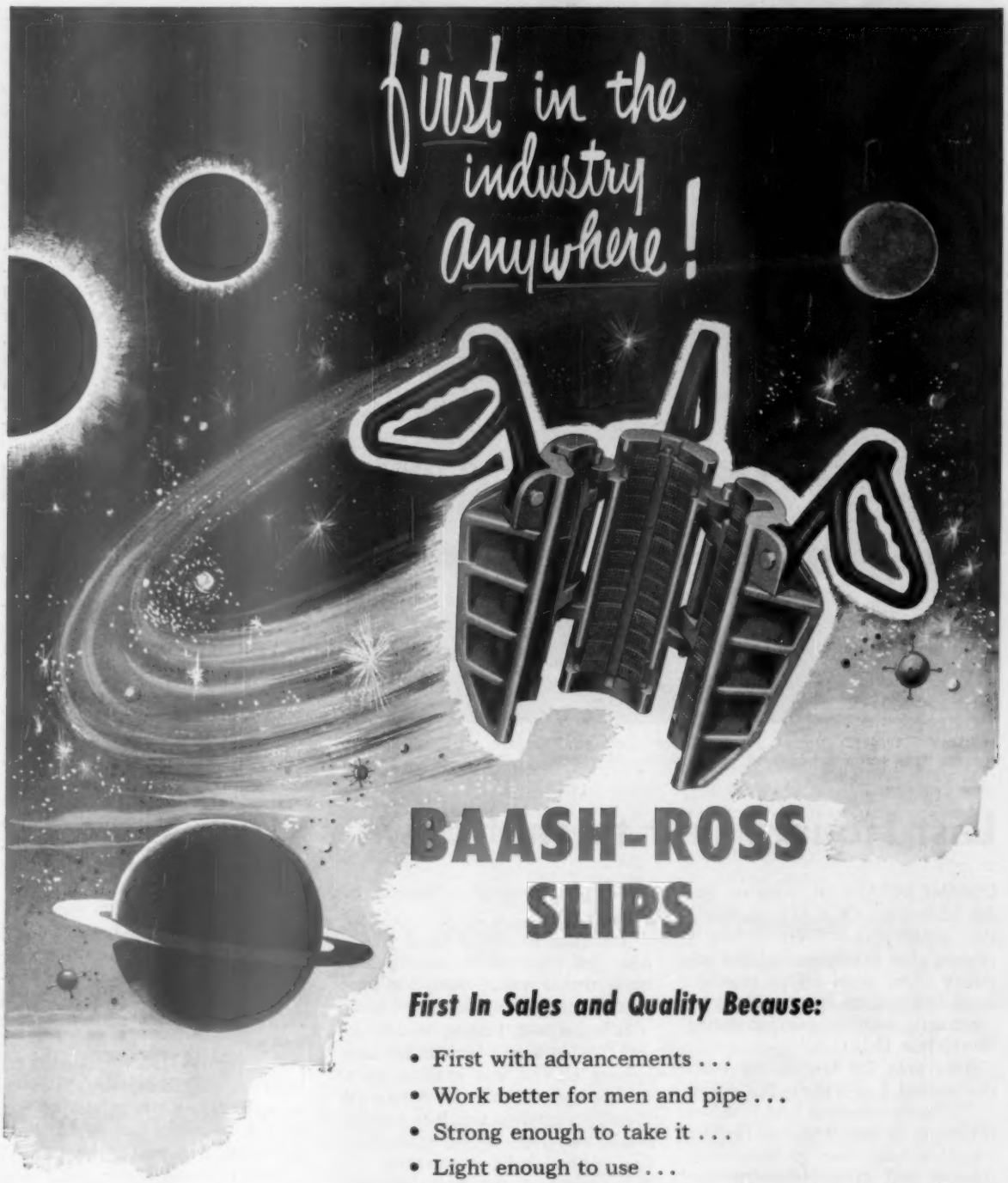
5. The higher the percentage of a particular component in a liquid mixture, the higher the percentage of that component in the vapor above the liquid.

6. The greater the vapor pressure of a particular component in a liquid mixture, assuming equal amounts of components in a mixture, the greater the percentage of that component in the vapor.

This material taken from process-training-program manual, Bayway, N. J., refinery of Humble Oil & Refining Co.


DISTILLATION PRINCIPLES
Every liquid exerts a vapor pressure
Vapor pressure of liquid increases with temperature
20
15
10
When vapor pressure of a liquid equals the external pressure on the liquid, it boils
Vapor pressure of a mixture equals the sum of the partial pressures of fractions
The vapor from a boiling mixture is enriched in the lower boiling fractions

SUMMARY of vapor-pressure concepts can be shown in a chart such as this. Fig. 7.



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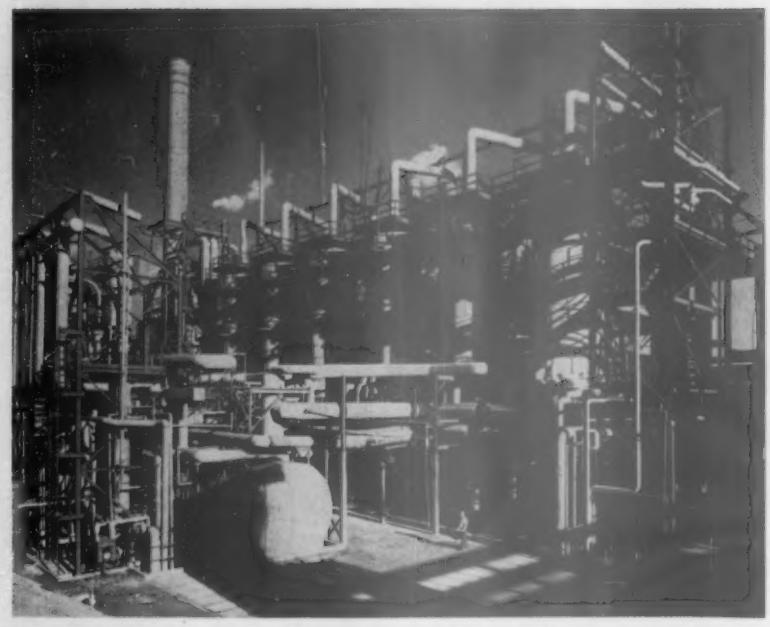


HOUDRY FIXED-BED process ushered in cat cracking. This one, at Sun Oil Co.'s Marcus Hook refinery has been operating for 21 years.

Last Houdry unit to shut down

COMMERCIAL cat cracking began at Sun Oil Co.'s Marcus Hook, Pa., refinery in 1937. It was a process that revolutionized the industry. And it set off an unparalleled construction effort spurred by the crucial need for gasoline during World War II.

This year the last of the units that started it all will be shut down.

The quiet announcement that Sun is retiring the last of the old Houdry fixed-bed units was a sharp contrast to that crisp November day in 1938 when Sun's Arthur N. Pew, in a paper delivered to API, startled the refining world by announcing that catalytic cracking was a commercial success. Few events in refining history could match the drama of that moment.

Three commercial units were already on stream, he said, and Sun and Socony-Vacuum Oil Co., Inc., were betting $35 million on 10 new units. The new process produced high-octane gasoline at unheard-of yields.

The road to that rostrum was a long one, full of frustrating setbacks, but it was a triumph of persistence and the belief in an idea.

It began with Eugene Houdry in 1922. What would become his consuming interest was sparked by a fellow Frenchman who showed Houdry a catalytic unit which could crack low-grade lignite into gasoline. Although he was trained for a career in the steel industry, Houdry immediately plunged into the search for a regenerative catalyst which could crack oil.

It took a tough, determined effort to unearth the answer, but Houdry found it in an aluminum silicate which was superior to the many catalysts then being investigated. It could be regenerated by burning off the carbon formed during the reaction. This was the key that led to the ultimate success of the Houdry unit.

But it would take many more years of persistence to make the dream pay off. Houdry tramped from office to office in search of someone who would buy this idea. But the oil companies had doubts that it could be scaled up into a workable process. Besides, many of the majors were developing their own routes to catalytic cracking.

In 1930, however, Houdry found a listener in Vacuum Oil Co.'s European representative. It was his first big break toward commercial development. The firm promised Houdry $100,000 in development costs if he could operate the process successfully for 15 days at Vacuum's Paulsboro, N. J., research center. He crated the apparatus and sailed west.

The unit did work and Houdry Process Corp. was formed, with Vacuum taking a one-third interest in the venture.

Then came the huge East Texas field with its glut of 10-cent crude oil. With funds exhausted, the development program was suspended. The market was saturated with gasoline and there was little interest in a process which would produce still more. Vacuum, which by this time had become Socony-Vacuum, approved a suggestion to look for a third party to help underwrite the cost.

Once again, Houdry pounded the streets to sell the industry. In 1933, he walked into the offices of Sun Oil Co. where he met Arthur Pew. He had to look no further.

The laboratory equipment was moved across the Delaware River to Sun's Marcus Hook refinery and development began anew. Sun engineers solved the problem of cyclic regeneration and scaled up the pilot plant into successful commercial operation.

On June 6, 1936, the first semicommercial unit went into operation at Paulsboro. The following year, on March 15, 1937, the first commercial unit began charging

12,000 bbl. per day of fresh feed at Sun's Marcus Hook plant.

After it was unveiled at the 1938 API meeting, the Houdry process grew rapidly. By the time World War II erupted in Europe, 12 U. S. plants with 132,000 bbl. capacity were turning out avgas for the allies. The process is credited by many to have been a major factor in helping the RAF to turn back the Luftwaffe in the Battle of Britain.

In its early form, the process consisted of a low-pressure heating coil plus three vapor-phase catalyst chambers. The catalyst chambers were used alternately and were switched every 10 minutes because carbon was laid down so rapidly. The cracked oil vapor was vented to a condenser and steam-jet evacuation system, while the catalyst was regenerated with preheated air. The air was purged by steam-jet ejectors to complete the 30-minute cycle.

On the commercial front, the cracking process gave Sun a wide competitive edge. Blue Sunoco gasoline was the rage on the East Coast.

Despite the competitive pressure on other companies which were developing a route to cat cracking, it was May 25, 1942, before fluid catalytic cracking made its debut and it was October 1943 before the first commercial Thermofor unit went on stream.

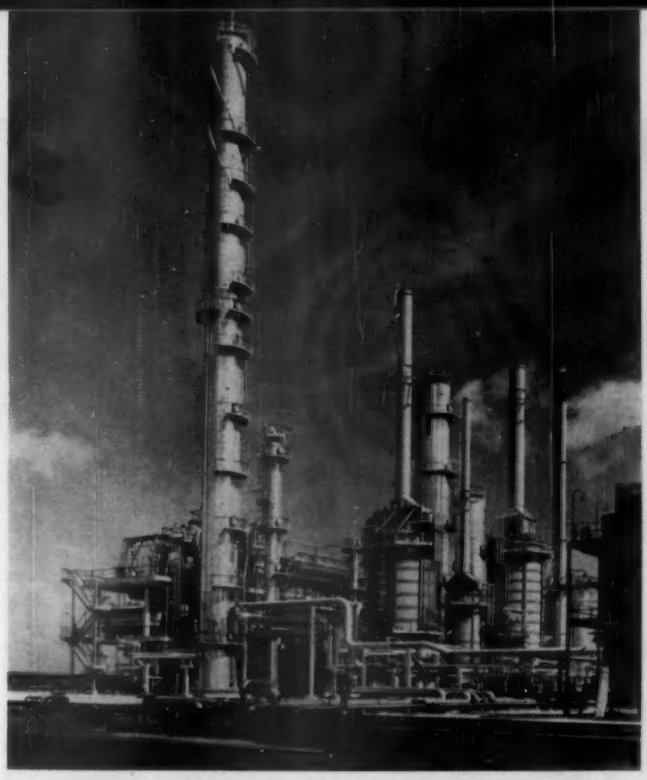
At the end of the war, about 244,000 bbl. per day of the Houdry fixed-bed process had been installed, but shortly after it began to be replaced by the pneumatic lift and fluid processes. Capacity continued to dwindle until in 1960 only one unit remained.

Last month Sun announced that it too would soon be gone.

Cities Service goes on stream with aromatics plant

AN AROMATICS PLANT, which includes both Udex and orthoxylene units, is now on stream at Cities Service Refining Corp.'s Lake Charles, La., refinery. Capacity of the Udex units is 8,100 bbl. per stream day, while capacity of the orthoxylene unit is 120 million pounds per year.

The orthoxylene unit is believed to be the largest ever built specifically for petrochemicals. Product is separated from mixed xylenes in a fractionating column over 220 ft. high, rather than the two or three-column system usually used in plants of this type.



ORTHOXYLENE IS SEPARATED from mixed xylenes in 200-ft. tower rather than normal two or three-column system.

Raffinate stream from the new unit will give Cities Service a low-luminosity jet-fuel stock as well as an aromatic concentrate which can be used for gasoline or as a charge stock for the production of other C_8 aromatics and toluene.

For operating convenience and efficiency the two units are closely integrated. Exchangers, accumulators, reboilers, pumps, etc., are grouped in a three-level structure which also includes a control room.

Badger Manufacturing Co. engineered and built the plant.

More copper in cat cracker catalysts

CHEMICAL ANALYSIS for this quarter shows a big increase in copper contamination. However, this is due to a change in method which has improved the accuracy of the copper test. There has been no actual increase in copper.

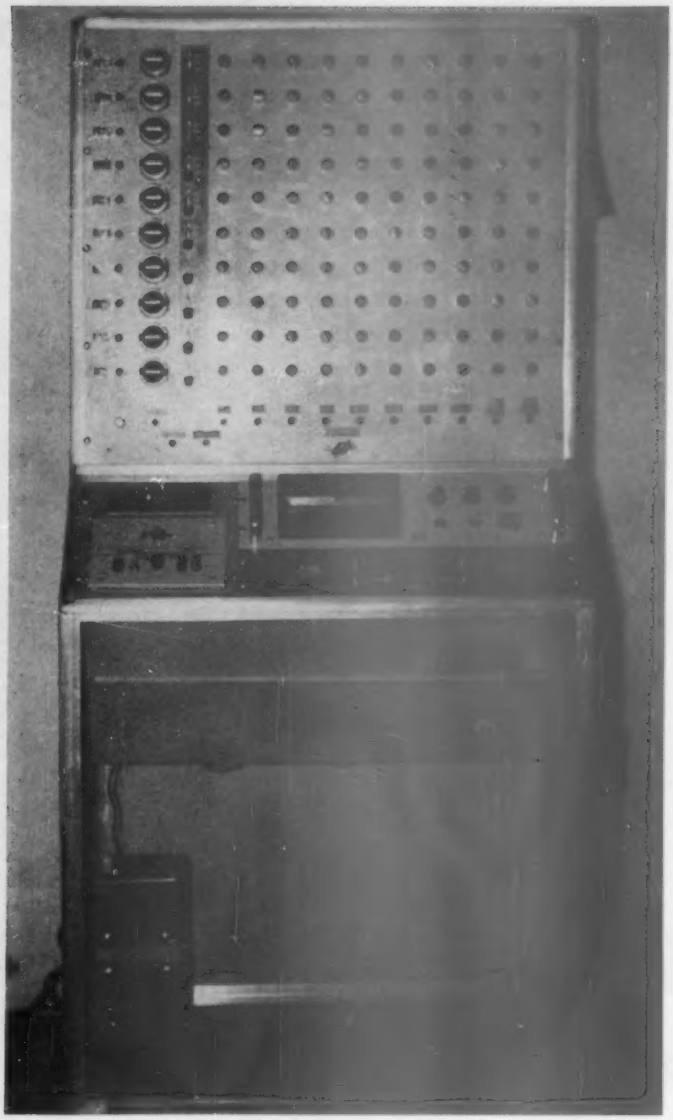
Other analyses show that sodium concentration has decreased from the previous quarter.

QUALITY TRENDS IN EQUILIBRIUM FLUID CRACKING CATALYSTS

(Based on Davison analyses of samples from over 55% of fluid units in the United States and Canada)

Period	Present Quarter Feb.-Apr. '61		Previous Quarter Nov. '60-Jan. '61		Year Ago Feb.-Apr. '60	
	Mean	Range*	Mean	Range*	Mean	Range*
Activity, D+L	29.4	23.9-34.8	29.6	24.1-35.1	29.3	23.8-34.7
Surface area, M^2/g	120	68-173	120	73-166	119	64-174
Pore volume, cc./g.	0.39	0.24-0.53	0.39	0.26-0.51	0.38	0.23-0.54
Apparent bulk density, g./cc.	0.72	0.61-0.83	0.72	0.61-0.84	0.72	0.60-0.84
Metal contamination:						
Vanadium, V: p.p.m.	200	45-900	192	45-824	196	45-852
Nickel, Ni: p.p.m.	83	17-409	77	15-406	85	15-489
Copper, Cu: p.p.m.	†27	8-87	4	0.5-35	4	0.5-32
Sodium, Na: p.p.m.	499	87-2,864	560	84-3,733	549	89-3,487
Iron, Fe: wt. %	0.34	0.11-1.08	0.35	0.10-1.22	0.39	0.12-1.31

*95% of fluid units tested fall within these limits. †New copper method.



Small computer solves big blending problems

Sohio built its own analog computer to solve linear equations. Accurate, inexpensive machine is easy to operate and requires little maintenance.

BY C. J. GOOD
Standard Oil Co. (Ohio)
Cleveland

A SMALL special-purpose machine is handling gasoline-blending calculations for Standard Oil Co. (Ohio). It's called the Sohio matrix multiplier.

It was designed to translate monthly refined-product schedules into daily operating orders. By increasing the speed and accuracy of gasoline-blending calculations, it has made better use of gasoline components. At the same time, it has cut the man-hours ordinarily required to perform these calculations. Little maintenance is required. The machine's cost is about $7,500 to $8,000.

To help you understand how this computer fits into the refinery and how it was justified, here's a brief look at our planning organization.

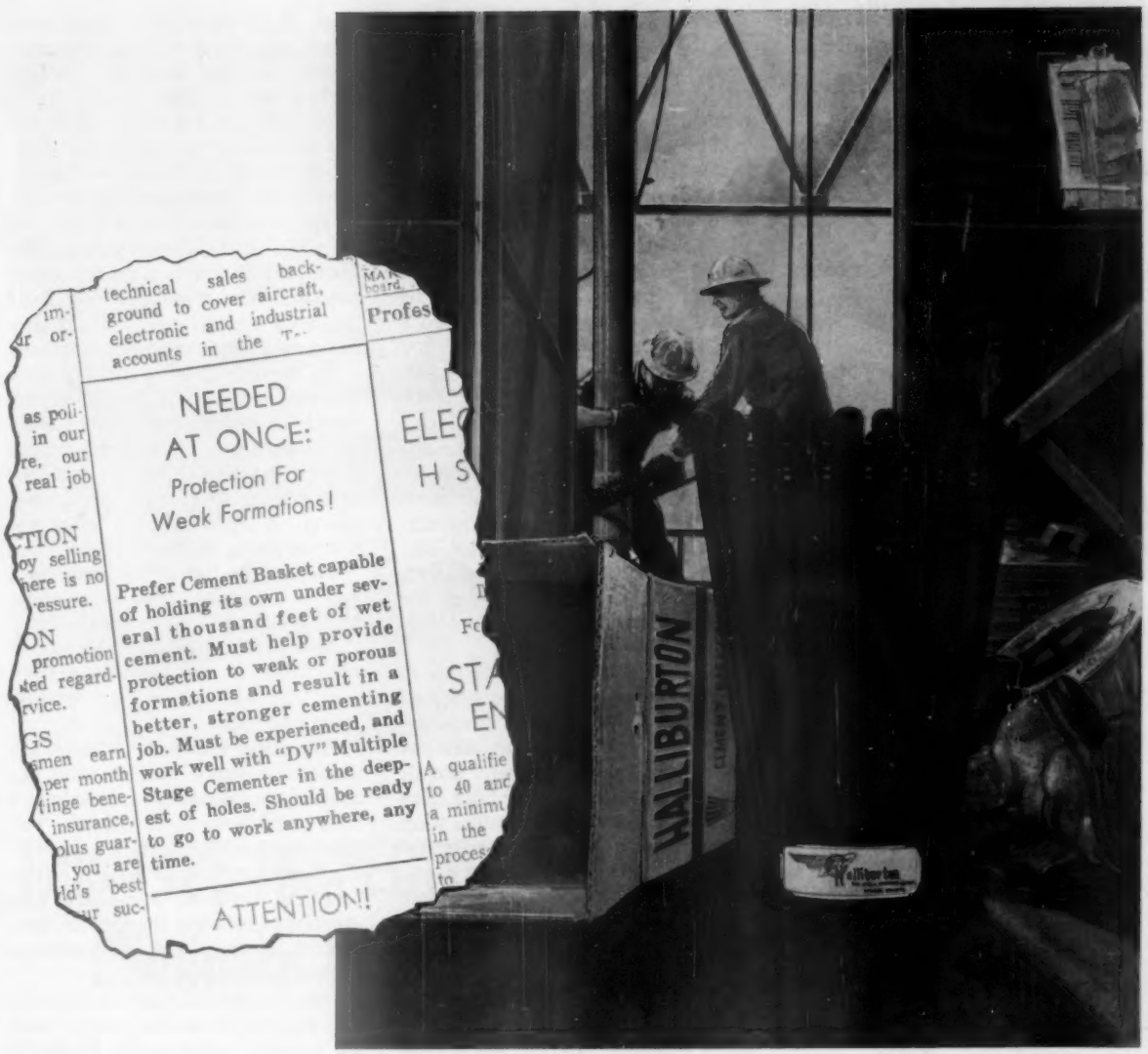
The short-range planning period is normally 1 month. Each month our marketing department estimates the gasoline demand for this period. The supply and transportation department modifies the sales estimate to include the effects of adjustments in gasoline inventory. Specific area demands are also estimated. Out of this process comes a forecast of the gasoline which must be supplied for the month from each of our three refineries.

The next step is performed by our home-office planning group. With the area demands as a basis, this group establishes the product budget for each of the refineries. Consideration is given to refinery capacity, comparative economics, scheduled shutdowns, and such other factors as will affect the refineries during the planning period.

The final step is handled by each refinery's planning group. With product demand as a basis, operating schedules are developed for each unit within the refinery. Recommended gasoline formulations for each of our two grades of gasoline are a part of this final plan.

Planning is aided in part with a digital computer. Both refinery simulation and linear programing are used. For gasoline planning, linear programing maximizes profitability by jointly considering component availability, TEL usage, and reforming severity. Input information includes, among other things, gasoline-component yields and quality. These data are obtained from records and

Presented to WPRA computer conference, Philadelphia.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represent the best estimate available for planning purposes. Solution of the linear-program model produces a gasoline-blending plan for the month which includes:

1. A formulation or recipe for each grade of gasoline.
2. Required reforming severity with the resulting reformate yield and quality.
3. TEL dosages for each grade of gasoline.

This information is turned over to the operating department to serve as their operating guide for the month.

Computer Justification

A month is a long time. Unit upsets, changes in crude oil, and deviations in yield or quality make it difficult to adhere strictly to the over-all plan. Tankage is limited. Product demands vary with the weather. All of this means that a refinery must be able to quickly provide for deviations from the plan. We must blend products rapidly and on short notice.

This means that deviations from the over-all monthly blending formulations are also necessary. Since the refinery must be prepared to blend gasoline at any hour of the day or night, our shift foremen must know how to make these blends. They are kept aware of the inventory situation, the trends in product demand, and of course, have as a basis the monthly operating plan.

An example will show the difficulty with this method.

Suppose our monthly operating plan calls for a blend of the composition shown in Table 1. In the

TABLE 1—TYPICAL TARGET BLEND

Component	Vol. %	R.v.p.
Cat distillate	20	5.0
Cat reformate	50	9.0
Alkylate	10	8.0
Light crude naphtha	15	15.0
Butane	5	68.0
Blend	100	12.0

percentages indicated, these components will make a 12-psi. vapor-pressure gasoline at 96 octane with 1.44 cc. per gal. of tetraethyl lead. However, when it comes time to make a blend, we find that the vapor pressure on the stabilized cat distillate is actually 4 psi. rather than 5 psi. as indicated in the plan.

If we had made this blend with the indicated formulation, the vapor pressure would have been about ¼ psi. too low. The equivalent butane required to bring this blend back to the full 12 psi. is about ⅓%, or about 100 bbl. for a standard 30,000-bbl. batch.

Assuming a 4-cent per-gallon differential between the purchase price of butane and the wholesale value of gasoline, the unrealized profit would be about $175 per batch. It is true that the butane could be added later after we had obtained a laboratory analysis on the mix, but the added cost of delays and losses might very well offset the benefits.

Similar illustrations for other specifications would illustrate the same point—each batch must be individually checked with the latest component quality data. The monthly operating plan is simply not adequate for daily operation. Therefore, we looked to other methods for speeding the daily blending calculations.

Since we had both large and small digital computers, we considered using them for this job. Investigation quickly showed that this approach was not practical. Blends must be calculated at any hour. Key punch and computer operators were necessary to use this equipment, yet were not available around the clock. Communications were not adequate to provide the quick service required for gasoline blending. It became obvious that the shift foremen would still have to do the calculations and that a small special-purpose computer of some type was the answer to our need.

Our requirements were that it should be accurate, quick, simple to operate, and inexpensive. Fortunately our research department had a group of people who had been interested in electronics and had built several experimental machines of the type we needed. They agreed to design and build this computer. The result was an analog computer which could solve a linear equation, such as $a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 + a_5 x_5 = A$.

How it Operates

The computer is built in a manner similar to the calculation form used in manual solution of the problem. We believe that this helps in "feeling" the problem. Operation is simple.

The panel face has 10 horizontal rows of 10 dials each. Each horizontal row stores data for one component. Starting at the left, the first vertical row of dials are the multipliers. These are used to set in the volume per cent of each component. A trial blend is chosen so that the sum of the components equals 100.

The next three rows are used for volatility or distillation points. The fifth vertical row is used for vapor pressure. The remaining five rows are used for octanes and for any other data which must be computed.

At the left of the panel for each horizontal row is a switching arrangement that permits either setting in the data on each component, including the data in the computation, or removing them from the computation. A light indicates when the data are being stored.

Across the top of the panel is a row of indicating lights which show the vertical row under consideration. A switching device at the bottom of the panel permits switching from one vertical row or specification point to another.

The time required to store the distillation vapor pressure and octane data originally and select a trial blend is about 10 minutes. The time required to change composition and read out a trial blend is less than 1 minute. Subsequent calculations involving changes in component qualities and compositions require only 3 or 4 minutes.

Since we have 10 horizontal rows, it is possible to reserve specific rows for specific components. Normally then, changes to each specification point are small and can be made rapidly. As many as 10 trial blends can be obtained in the time it previously took to obtain 1. This reduction in time and the ease of computation promote more careful examination of the possible blends and significantly improve the use of gasoline stocks.

Normally the first trial blend will be made at the composition shown in the monthly operating plan. This composition is then modified to meet specifications.

Multiple testing has shown that the matrix multiplier will duplicate a blend of gasoline within ±½% on the distillation or volatility points and about ±1/10% on the vapor pressure.

Octane calculations require some modification as they are nonlinear.

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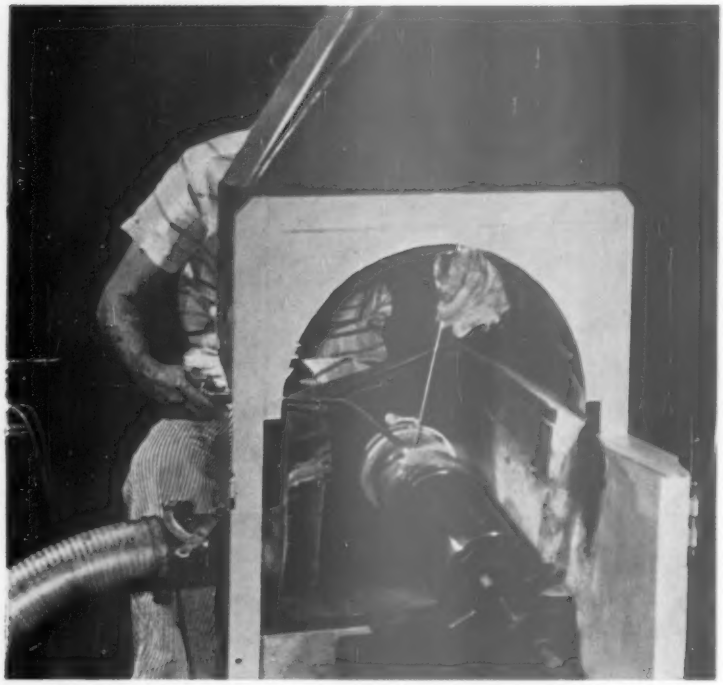

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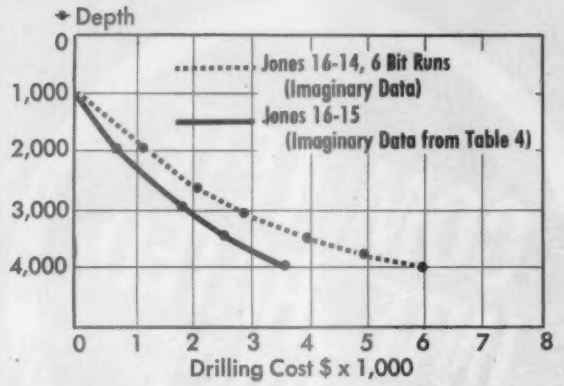
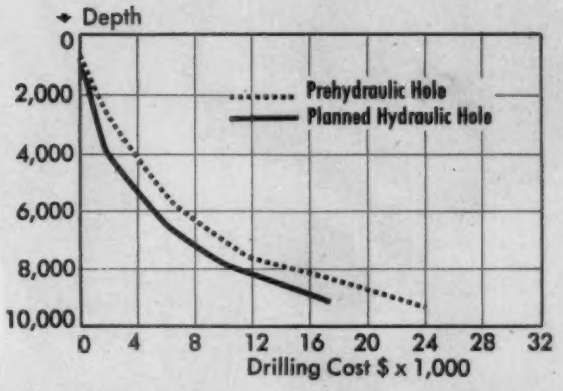


ACCUMULATED DRILLING COST, plotted as drilling progresses, is good method of spotting any bad drilling practices. It also is a practical method of keeping direct drilling cost separated from other costs. Fig. 1.



ACTUAL FIELD TESTS of good jet-bit hydraulics shows decided cut in drilling costs compared to tests drilled with older practices. Footage per bit rose 89% and drilling was 25.3% faster with the planned hydraulics. Fig. 2.

In California's unusual formations

Lower annular velocity and jet-bit hydraulics speed drilling

It hasn't been a question of too little, but one of putting it in the wrong place that's been slowing down California drilling. By using the pump horsepower to deliver high volume, drillers didn't drill as fast as they could by putting the emphasis on more pressure at lower volumes. Field tests with lower mud volumes and lower annular velocities, used with good jet-bit hydraulics, realized a 15% cut in drilling cost.

BY B. M. BUMGARDNER
Hughes Tool Co., Bakersfield, Calif.

CALIFORNIA DRILLERS are discovering a seemingly small fact which is helping them make big cuts in well costs.

For years everyone thought that the mud in the annulus needed a high rising velocity during drilling in order to keep the hole clean. Most used 180 ft. per minute as the minimum. Now it has been proved that lower velocities—100 to 120 ft. per minute — are adequate in most California formations.

Using the lower annulus velocity means that less mud need be circulated. Less mud means that surface pressures can be higher and that more of the pressure loss can be taken at the bit where it does the most good. It also means the most effective jet-bit action to speed drilling and cut costs.

Beauty is that the effective jet-bit drilling program does not require any big change in rig equipment.

The lower annulus velocities have been tested in the field. Drilling cost on the test holes was cut an average of 15%. Moreover, the maximum pressure on the mud pump did not exceed 2,500 psi. Table 1 lists some of the holes drilled in California with low annulus velocity.

No unusual problems. With the equipment and large hole sizes common to California, it is almost impossible to obtain 180-ft. per minute annular velocity and still have good jet-bit hydraulics. For this reason, a series of tests was made to determine how low annular velocity could be and still keep the hole clean. We haven't yet settled on a minimum figure. Many thousands of feet have been drilled in almost every area of California with velocities much lower than past practice. And, there were no unusual problems on any of these wells.

In several cases the crews had less trouble making round trips in holes drilled with low annular velocities than they did on holes using higher velocity. On a test in Hall Canyon near Ventura, annular velocity was only 90 ft. per minute while drilling with water in 12¼-in. hole. There was no hole trouble. On the same well, velocity was only 130 ft. per minute in the 10⅝-in. portion of the hole. Again, water was the drilling fluid and again there was no hole trouble.

We must not lose sight of the amount of formation that must be carried out by the circulating fluid. As an example, average penetration

This is an abridged version of a paper titled, "Reduction of Drilling Cost in California By the Use of Engineered Hydraulic Programs," presented at the API Division of Production's 1961 meeting of the Pacific Coast District, Los Angeles.

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TABLE 1—LOW ANNULAR VELOCITY TEST HOLES

Field—	Hole Size (in.)	Av. Drilling Rate (Ft. per Hour)	Annular Velocity (Ft. per Min.)	Interval Drilled (Ft.)
Antelope Hills	9⅞	125	110	2,200
Paloma	10⅝	30	70	4,000- 9,000
Old River	9⅞	30	135	7,000-11,000
Arvin	9⅞	25	45-90	6,500- 9,000
Wheeler Ridge*	10⅝	40	110	2,000- 5,300
Tejon	10⅝	10	110	6,700- 8,700
Paloma	7⅞	85	125	500- 5,600
Castaic	9⅞	30	145	7,000-11,000
Brea	9⅞	20	90-100	4,000- 7,600
Riverdale†	7⅞	300-100	125	500- 7,000
Coalinga	9⅞	50	125	500- 9,300
Hall Canyon	10⅝	200- 50	130	1,200-10,000

*8 holes. †5 holes.

rate in most 9⅞-in. holes in California is 50 ft. per hour or less. Circulating 380 g.p.m. with 4½-in. pipe in a 9⅞-in. hole results in an annular velocity of 120 ft. per minute. When drilling at 50 ft. per hour, the formation being removed is about 3.4 g.p.m. The concensus is that the 380 g.p.m. of drilling fluid will remove the 3.4 g.p.m. of formation.

In the Hall Canyon test as much as 20 g.p.m. of formation was going into 460 g.p.m. of water. Cuttings were still removed and the hole cleaned adequately.

Table 2 lists popular hole sizes and the amount of formation removed when drilling at a rate of 100 ft. per hour. Table 3 gives the minimum annular velocities recommended for calculating hydraulics programs in California; many times, annular velocity has been much less with no hole trouble.

TABLE 2—FORMATION REMOVED FROM VARIOUS HOLE SIZES
(Based on a penetration rate of 100 ft. per hr.)

Hole Size (In.)	G.p.m. of Formation
7⅞	4.2
8¾	5.2
9⅞	6.7
10⅝	7.7
12¼	10.2

TABLE 3—MINIMUM RECOMMENDED ANNULAR VELOCITIES
(Based on findings to date)

Hole Size (In.)	Annular Velocity (Ft. per Minute)
12¼	80
10⅝	90
9⅞	100
8¾	100
7⅞	120
6¾ and less	130 or greater

There was no hole trouble using low annular velocities in holes where several whipstocks were set. However, there have been no tests in directional holes of more than 10°. We have no tests to indicate whether low annular velocities will keep the hole clean when drilling gravel beds or very sticky shales.

Pressure. The best jet programs are those that circulate minimum volumes at maximum pressures. If the circulation rate yields only the required minimum annular velocity, most pressure will be available at the bit. Otherwise, the pressure is consumed as line friction. Ordinarily in California, a maximum surface pressure of 2,500 psi., when properly used, yields good hydraulics. With heavy mud (120-130 lb. per cu. ft.) and deep, small holes (12,000 ft. and 3½-in. drill pipe) pressure may exceed 2,500 psi., but these are extreme cases in California.

Jet programs have been improved to around 9,000 ft. with maximum surface pressure of 1,600 psi. in 9⅞ and 10⅝-in. holes with 75-lb. per cu. ft. mud. Results were good when a maximum surface pressure of 1,400 psi. was used to drill five 7⅞-in. holes to 7,000 ft. with 3½-in. drill tubing. Shallow (2,000-3,000 ft.) holes being drilled with

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1,000 psi. have shown improvement over former methods, which accented high circulating volumes.

The important thing when considering pressure is the manufacturer's rating of the pump. Overloading not only raises pump-maintenance cost, but also increases rig down time. In most cases pump costs were reduced on the test holes. Prior to the hydraulic programs, most of the rig pumps had been run with large liners and had been overloaded 25 to 100%. Gage pressure on most wells was not increased more than 200 psi. No pump was overloaded more than 5%. With near-constant pressures, fluid-end wear did not increase; power-end maintenance came down since the pumps ran at rated loads.

Jet velocity. An efficient jet bit is similar to a broom. The jetting action sweeps the bottom of the hole of loose cuttings. Then, the rock bit teeth can attack virgin formation. In very soft formations, a high-velocity jet will actually "drill" the hole with little help from the bit teeth. In one case, a bit was worn to the nozzles (cones and bit legs worn off), but was drilling at a rate of 50 ft. per hour when pulled.

In hard formations high jet velocities not only keep the bottom clean, but may also remove small cuttings loosely attached to the bottom. Where heavy muds are used, the high-velocity jet aids in removing filter cake from the bottom of the hole; this cake otherwise would likely hold the cuttings on bottom and slow drilling.

In the wells discussed here, jet velocities ranged from 250 to 470 ft. per second. The higher velocities appeared better but results were satisfactory with velocities of 250 ft. per second. Likely, it takes higher jet velocities to improve drilling rate in hard formations than in soft formations. In extremely soft formations, jet velocity of 250 ft. per second might be very effective, but 350 ft. per second might be little help in very-hard formations.

Jet velocity should normally be 250 to 500 ft. per second. When it drops below 250 ft. per second in 7⅞-in. and larger holes, jet bits may not be worth their cost; you can determine by alternating regular bits with jet bits and calculating cost per foot of hole with each. With the broken formations in California, at least four bits should be compared before any conclusions are drawn.

Jet nozzles. For the most efficient hydraulics, jet nozzles should be changed as the hole deepens or as mud gets heavier.

You can use different orifice sizes at the same time in the same bit. As an example, instead of stepping from three 3/8-in. jets to three 13/32-in. jets, it would be more efficient to proceed in the following manner: three 3/8-in., then two 3/8-in. and one 13/32-in., then two 13/32-in and one 3/8-in., and then three 13/32-in. The gradual increase in jet sizes allows maximum horsepower at the bit with little change in pump speed.

If small jets become a problem by plugging, use two larger jet nozzles (with the same area of the three smaller jet nozzles) and a blank nozzle. More than 150 bits have been run in California using a blanked-off jet and no bearing failures have resulted.

Proper Use of Pumps

Just because there's a lot of horsepower available to the pumps and just because there's a high pressure on the pump gage does not necessarily mean hydraulics at the bit are good. Consider the case of a small rig going to 5,000 ft. drilling alongside a much larger rig drilling a deep test.

Both rigs were drilling 10⅝-in. holes. At 5,000 ft. the smaller rig was supplying 430 hp. to the pump, had 250 h.hp. at the bit, and a nozzle velocity of 345 ft. per second. At 5,000 ft. the larger rig was supplying 670 hp. to the pump, had 280 h.hp. at the bit, and had a nozzle velocity of 315 ft. per second. By proper use of its 670 input horsepower, the larger rig could have had 445 h.hp. at the bit and 460 ft. per second nozzle velocity.

As another example of the right and wrong ways to use hydraulics, let us assume we are drilling a 9⅞-in. hole with a 16-in. pump running 60 s.p.m. Our maximum pressure is 1,560 psi. with 6-in. liners and 1,130 psi. with 7-in. liners. We have a 300-ft. string of 7-in. drill-collars which have a 2¾-in. bore. Drill pipe is 4½-in. with full-hole tool joints. We have 420 hp. available to circulate the 75-lb. per cu. ft. mud.

Under these conditions, we could

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manitain jet velocity at 250 ft. per second to a depth of 12,300 ft. with 6-in. liners. At 7,000 ft. with the 6-in. liners, 61% of the hydraulic horsepower would be at the bit, and nozzle velocity would be 321 ft. per second. With a 7-in. liner jet velocity could be maintained at 250 ft. per second no deeper than 3,000 ft. To go deeper with a 7-in. liner would mean using regular bits or inefficient use of jet bits to around 7,000 ft. At 7,000 ft. the pump would be overloaded without a bit on the drill string.

Weight on bit. It is common knowledge that increasing weight on bit generally increases penetration rate, if the hydraulics keep the bit clean. Heavy weight has been tried in California, but crooked-hole problems have complicated such tests. High bit weight was tried on only one of the wells mentioned here. Results were outstanding even though weight did not exceed 30,000 lb. on a 9⅞-in. bit.

Most of the improvements we discuss were due to better hydraulics alone. There is little doubt that improvements would be greater if weight on the bit were increased. Still, danger of crooked hole in California makes caution necessary.

What Foot of Hole Costs

Equation 1 is a method to calculate cost per foot of hole.

$$C = \frac{B+DXR+TXR}{F} \qquad (1)$$

Where:

C = Drilling cost, dollars per foot
B = Bit cost, dollars
D = Drilling time, hours
R = Rig operating cost, dollars per hour
T = Round-trip time, hours
F = Footage drilled by bit, ft.

To demonstrate, assume rig operating cost is $50 per hour and a bit costs $200. A round trip takes 0.6 hour per 1,000 ft. Bit 1 went into the hole at 11,500 ft., made 50 ft. in 10 hours and was pulled. Bit 2 was pulled at 12,065 ft. after drilling 65 ft. in 14½ hours.

Bit 1

$$C = \frac{\$200 + (10 \text{ hr.})(\$50/\text{hr.}) + (7.2 \text{ hr.})(\$50/\text{hr.})}{50 \text{ ft.}} = \$21.20 \text{ per foot.}$$

Bit 2

$$C = \frac{\$200 + (14.5 \text{ hr.})(\$50/\text{hr.}) + (7.22 \text{ hr.})(\$50/\text{hr.})}{65 \text{ ft.}} = \$19.80 \text{ per foot.}$$

In this formula, drilling time includes only actual time the bit is on bottom drilling. For simplicity, connection time can be included with little error. Circulation time for samples, down time for repair, and so forth, should not be included in drilling time.

Round-trip time should be the average from the time one bit leaves the bottom until the next starts drilling. Rig-operating cost should be the value the owner places on the rig when bidding a hole. It should include normal profit, direct operating costs, and maintenance costs.

Cumulative cost curve. The cumulative drilling-cost curve is a practical method of separating direct drilling cost from other costs. It is good on all wells but extremely important on any planned program. The drilling-cost formula (Equation 1) is used to calculate cumulative drilling cost. Since this formula accounts for most time in drilling, the cumulative cost curve should run roughly parallel, but lower than the 24-hour depth-progress curve normally kept. This is the case when the dollars per rig-day equal in scale one 24-hour day.

Suppose the cumulative cost curve runs much lower than the 24-hour curve. This shows that rig time is being spent for purposes other than drilling and making normal round trips. It could be time used for casing and cementing, fishing, circulating for formation samples, testing, coring, major repairs, or slower round trips than planned.

Records aren't too meaningful in the surface hole since surface forma-

"Rig personnel must be told of the program . . . and its effect on their jobs."

TABLE 4—ACCUMULATIVE DRILLING COST

Assume: Round-trip time 0.6 hours per 1,000 ft.
Bit cost $200
Rig cost $50 per hour

Bit No.	Depth out	Footage	Hours	Rig cost	Drilling cost ($)	Trip cost ($)	Total cost ($)	Accumulative cost ($)
1	2,000	1,000	10	200	500	60	760	760
2	3,000	1,000	15	200	750	90	1,040	1,800
3	3,500	500	10	200	500	105	800	2,600
4	4,000	500	15	200	750	120	1,070	3,670

tions in California are unpredictable.

Whipstock bits should not be included in the calculations.

Table 4 demonstrates accumulative drilling-cost calculations on an assumed location, Jones 16-15. Fig. 1 plots the same data along with an imaginary curve of a comparison well (Jones 16-14). The savings would be $2,330.

Steps in Planning

The following steps are a simple and useful method of planning an efficient hydraulic program.

1. Select the minimum practical annular velocity (See Table 3).

2. Select a liner that gives the desired annular velocity when the pump runs near rated speed.

3. Design the program for maximum pressure of the pump liner. If there is no limit on pressure other than the manufacturer's ratings of the liner, use this. To keep costs down, do not exceed 2,500 psi. under normal conditions.

4. Plan the jet program so that pressure is maintained at maximum by (1) changing jet sizes as the hole deepens, and (2) by slight variation in pump speed.

5. Design a practical program. Do not go to extremes on either low annular velocity or high jet velocity. Maintain jet velocity in the range of 250-500 ft. per second.

6. Have a multichannel recorder on the rig. The recorder should not be a tattle-tale, but should record penetration rate, weight on bit, and pump pressure. In many cases, down time has been recorded as drilling time; this instrument allows a company to put repair time, drilling time, etc., in proper perspective.

7. Keep an up-to-date accumulative drilling-cost curve.

8. Rig personnel must be told of the program, what is to be gained by it, its effect on rig equipment, and its effect on their jobs.

You can "sell" hydraulic programs to roughnecks by explaining how efficient hydraulics reduce the number of bits and round trips. The drillers can be sold by the economics of the program, the reduced number of trips, or the possible decrease in pump repairs. Tool pushers are enthusiastic if shown how they can reduce the number of bits or reduce the total number of days to drill the hole.

Put an up-to-date accumulative drilling-cost curve in the dog house showing a comparison between the test hole and an offset hole. The curve tends to create a competitive spirit and a desire to improve on what has already been done.

Results in the field. A contractor drilled two 9⅞-in. holes near Coalinga with the same rig and tool pusher. On the prehydraulics hole 7-in. liners were used in a D-500 pump at a speed resulting in an annular velocity near 180 ft. per minute. Both regular retip bits and jet retip bits (nozzle velocity below 200 ft. per second) were used on top hole. New regular bits were used in the bottom 1,000 ft. of the hole. The maximum gage pressure was 1,000 psi. The weight on the bit was approximately 10,000 lb.

The planned hydraulic program was on the basis on 125-ft. per minute annular velocity. Maximum surface pressure with 6-in. liners in the D-500 pump was 1,600 psi. All new jet bits were used with jet-nozzle velocities from 356 ft. per second on top hole to 300 ft. per second at 9,000 ft. Weight on the bit was 25,000 to 30,000 lb. Pump repairs were normal and hole conditions were good.

Table 5 and Fig. 2 give results of this test.

Footage per bit rose 89% and drilling rate was 25.3% higher. Drilling cost was 25.9% less.

Table 6 sums up the planned hydraulic holes drilled in California where accurate cost comparisons could be made.

Over-all footage per bit rose 33.7% and drilling rate increased 22.8%. Drilling cost on the hydraulic program wells was 15.1% less.

TABLE 5—COMPARISON SHOWING IMPROVEMENTS GAINED BY PLANNED HYDRAULICS

	Calculated hydraulics	Fire hydraulics
Total footage	8,796	8,788
No. of bits used	†17	*32
Avg. footage per bit	518	274
Total rotating, hours	231	290
Avg. drilling rate, ft./hr.	38.1	30.4
Total cost	$17,831	$24,077
Avg. cost per ft.	$2.03	$2.74

*23 retip, 9 new. †New.

TABLE 6—SUMMARY OF RESULTS IN PLANNED HYDRAULIC HOLES

	Calculated hydraulics	Fire hydraulics
No. of wells	11	10
Total footage	49,890	49,682
No. of bits used	213	284
Avg. footage per bit	234	175
Total rotating, hours	2,104	2,578
Avg. drilling rate, ft./hr.	23.7	19.3
Total cost	$196,200	$230,000
Avg. cost per ft.	$3.93	$4.63

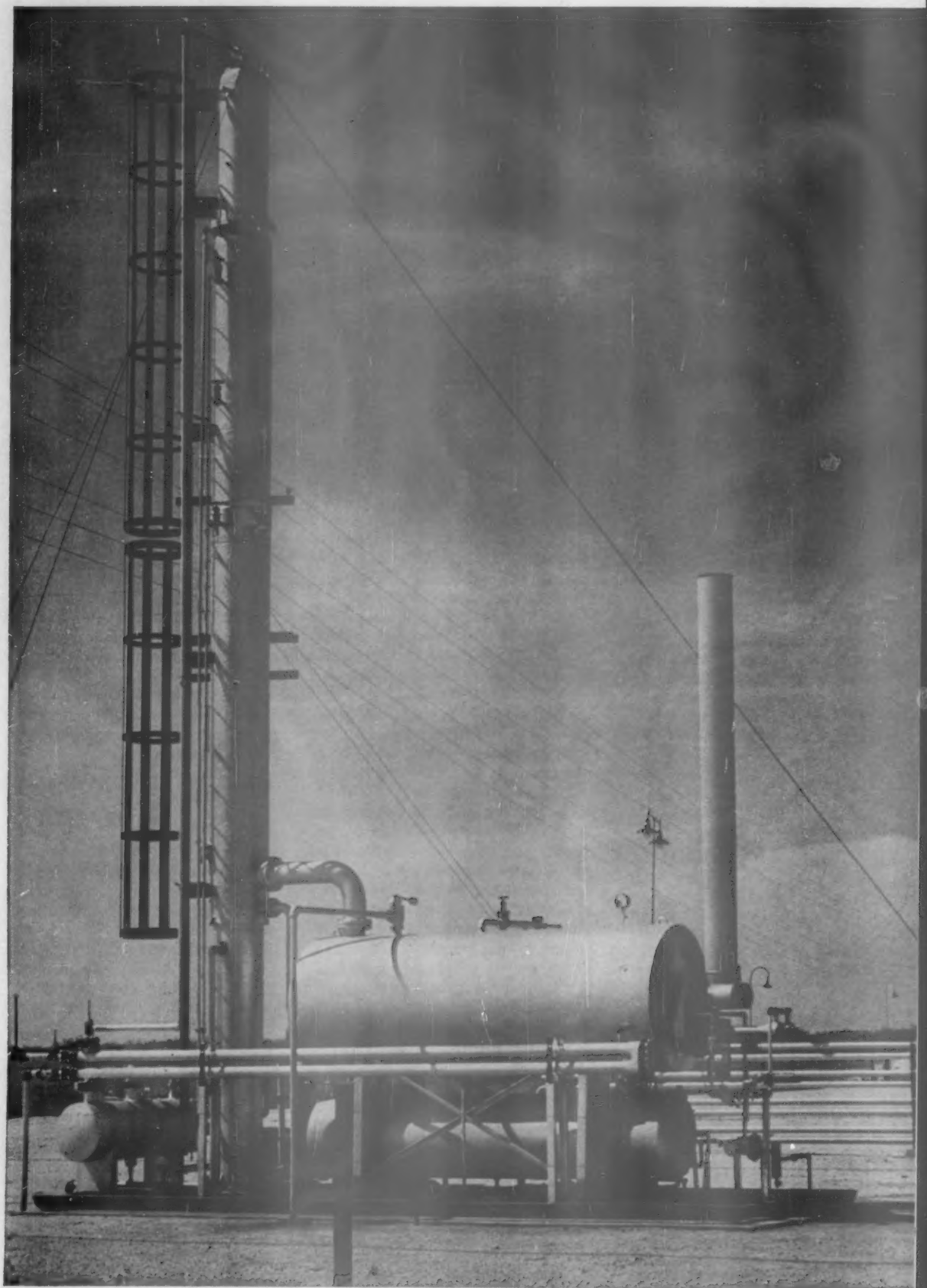
Bibliography

1. Hughes Tool Co., "Hydraulics for Jet Bits": Bulletin 2-D, Revised June 1960.

2. Cunningham, R. A., and Eenink, J. G., Hughes Tool Co.: Journal of Petroleum Technology, T. P. 8048 (1959).

3. Speer, John W., Shell Oil Co., "A Method for Determining Optimum Drilling Techniques": API Paper No. 926-3-1, February 1958.

4. Woods, Henry B., Hughes Tool Co., "Analysis of Rock Bit Performance Data": World Oil, September 1951.



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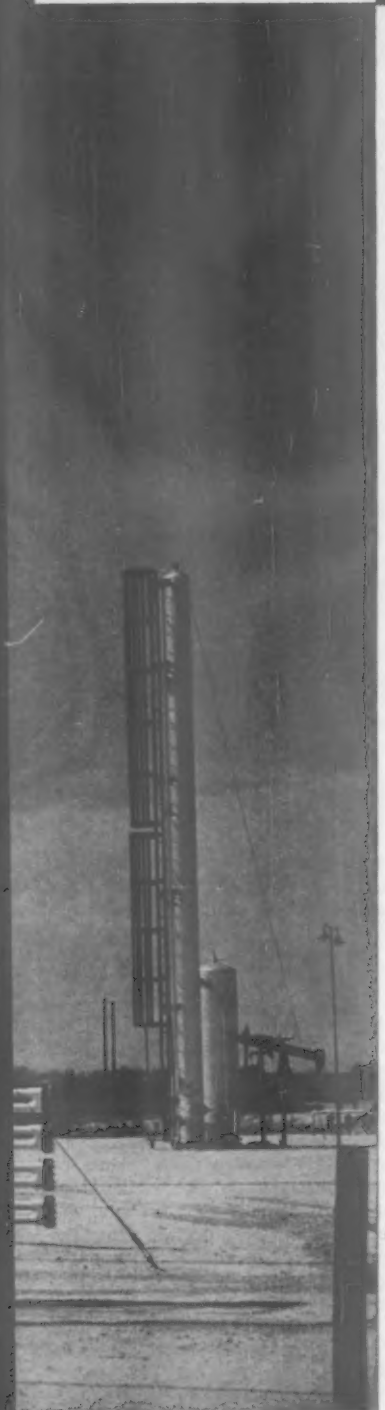

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BY W. L. NELSON, Technical Editor and Petroleum Consultant

Operating costs of typical refineries

THE OPERATING COST of average U. S. refineries was outlined in Process Costimating No. 5, "How Refinery Operation Costs Have Risen" (OGJ, Mar. 24, 1958, p. 211). Such average costs are useful but they fail to introduce two important variables, namely (1) size and (2) type of management. Accordingly, Table 1 is a comparison of the cost of operating a complete (average) 150,000 bbl. per day refinery and a fuel-type 20,000 bbl. per day refinery located in the Mid-Continent area.

A 150,000 bbl. per day fuel-type refinery located on the East Coast is also included for comparison with the small Mid-Continent fuel-type plant, and also shown is the average cost of refining for the United States. A small complete refinery (such as in Pennsylvania or Oklahoma) was not included because such operations are not uniform or representative.

The kinds of processing operations are indicated in Table 2 and some of the figures used or derived during computations are shown in Table 3.

TABLE 1—APPROXIMATE OPERATING COSTS OF AVERAGE AND TYPICAL FUEL-TYPE REFINERIES IN THE UNITED STATES, CENTS PER BARREL

	Average operation*		Average 150,000 B/D		Fuel-type 150,000 B/D		Fuel-type 20,000 B/D	
	1956	1958	1956	1958	1956	1958	1956	1958
Location	U.S.A.		None in M.-C.†		East Coast		Mid-Cont.	
Purchased fuel	11.4	13.6	15.6	18.1	19.7	21.0	8.1	9.8
Total labor	50.2	53.4	53.2	56.1	40.7	46.6	25.9	29.3
Purchased power	2.1	2.4	1.9	2.3	2.6	3.0	3.0	3.5
Maintenance materials	6.6	6.7	9.4	9.7	7.2	8.2	6.5	6.8
Chemicals and supplies	10.1	11.1	12.2	12.9	9.6	11.0	9.1	11.0
Tetraethyl lead	9.9	10.1	9.5	9.7	13.7	13.8	11.3	11.3
Subtotal	90.3	97.3	101.8	108.8	93.5	103.6	63.9	71.7
Ins., taxes, etc. (2.15%)	5.5	6.0	7.1	7.4	6.1	6.7	4.3	6.3
Interest or dividends (4%)	10.3	11.2	13.3	13.8	11.4	12.5	8.0	11.8
Improvements and obsolescence	16.2	17.9	21.0	22.0	17.9	19.9	12.6	18.8
Royalties or research	3.2	3.6	3.2	3.6	3.2	3.6	3.2	3.6
Total operating cost	125.5	136.0	146.4	154.6	132.1	146.3	92.0	112.2

*Although the average refinery throughput was about 30,000 bbl. per day, these average operating costs should not be considered as those of a 30,000-bbl. per day refinery. †None in Mid-Continent. Plants about equally distributed at East Coast, North Central, California and Gulf Coast (1958).

TABLE 2—OPERATED CAPACITY (FEED) OF PROCESS UNITS AS PERCENTAGE OF CRUDE CAPACITY

	Average operation*		Average 150,000 B/D		Fuel-type 150,000 B/D		Fuel-type 20,000 B/D	
	1956	1958	1956	1958	1956	1958	1956	1958
Crude distillation	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Thermal cracking	18.5	16.0	18.1	15.6	22.0	19.1	22.0	11.9
Thermal reforming	3.5	2.0	3.4	2.0	4.2	2.4	....	....
Viscosity breaking	4.0	5.0	3.8	4.9	4.8	5.9	4.8	6.0
Coking	3.4	4.5	3.3	4.4	4.0	5.4	....	1.2
Catalytic cracking	39.0	43.5	38.2	42.8	46.3	52.0	46.5	53.5
Catalytic reforming	11.1	19.4	10.8	18.9	13.1	23.1	14.3	23.8
Polymerization†	1.4	1.2	1.4	1.2	1.7	1.4	1.7	1.6
Alkylation†	2.8	3.55	2.7	3.5	3.3	4.3	1.7	3.6
Hydrogen treating	5.2	14.3	5.6	15.2	6.8	18.6	0.6	6.0
Vacuum distillation	23.8	26.5	23.2	25.7	25.9	28.0	25.0	28.0
Lube manufacture†	2.1	1.9	4.2	3.8	....	....	....	....
Asphalt	2.9	§2.8	2.8	2.75	....	....	....	....
Light oil treating‡	42.0	43.5	40.3	41.0	48.0	48.7	48.0	48.0
Complexity¶	6.86	7.64	8.06	8.72	6.29	7.38	5.15	6.73

*Although the average throughput was 30,000 bbl. per day for refinery, these average costs should not be considered as those of a 30,000-bbl. per day refinery. †Amount of product rather than feed. ‡Not all products receive treatments that are significant with respect to cost. §Operating rate decreased during 1958 although capacity increased. ¶Somewhat the "times" more complex than the topping of a barrel of crude oil.

These are based to a large extent on information published in the Process Costimating series although some modifications were necessary.

The kind of plants considered are (also see Table 2):

Average U. S. operation. Although the average number of barrels processed per refinery during 1956 (and 1958) was about 30,000 per day, these average operating costs should not be considered as the costs for a 30,000-bbl. per day refinery.

Average 150,000 bbl. per day. All refineries of this size operating in the U. S. Twice as much lubricating oil as the national average was assumed to be produced in these plants and the average oil processed in these plants contains more than an average amount of sulfur. No 150,000-bbl. per day plants are situated in the Mid-Continent region. The 19 or 20 such refineries are located in almost equal numbers at the East Coast, Gulf Coast, California, and in the North-Central region.

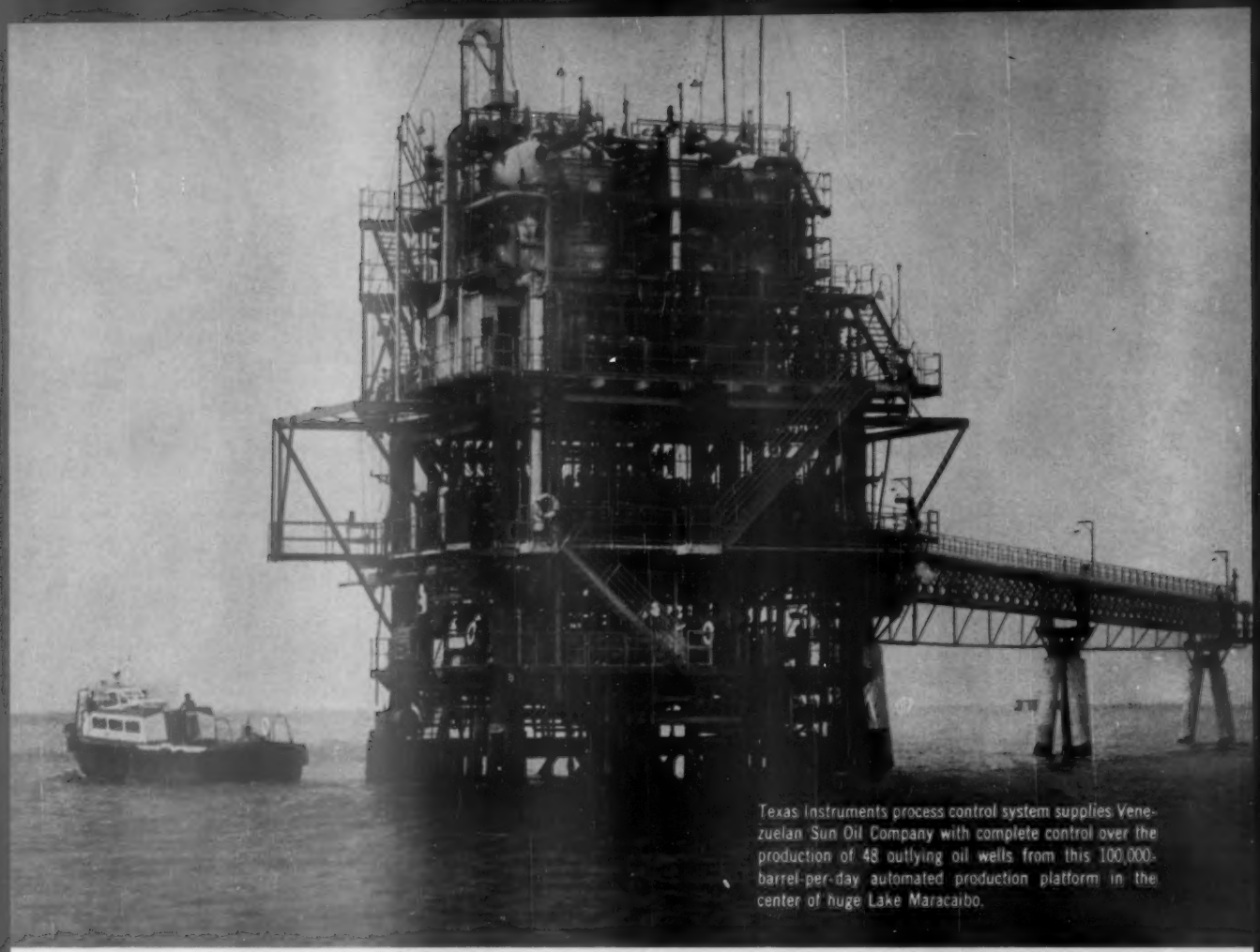
Fuel-type 150,000 bbl. per day. Located on East Coast and processing somewhat higher-sulfur crude oil than the U. S. average. The processing of higher-sulfur crude oil affected the operating cost only through maintenance materials (9-10% larger than for an average sulfur content) and by a slightly larger plant cost.

Fuel-type 20,000 bbl. per day. Located in Mid-Continent area and operated by small or independent managements.

The meanings of the cost items of Table 1 are:

Purchased fuel. The total fuel required for heating, vaporization, chemical reactions, steam, gas engine power, etc., was computed (approximated) for each of the operations of Table 2, and such a total can be checked for average U. S. plants by data published each year by the U. S. Bureau of Mines. From this total was subtracted the heat derived from the combustion of catalytic coke and the burning of dry plant gas (except that used in hydrogenation). These figures as well as the amounts of steam used in the various refineries are shown in Table 3.

The following fuel prices were used:



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	Cents per million B.t.u. (gross)		
	1956	1958	Notes
U. S. average	27.8	28.7	Proc. Costimating No. 4, OGJ, Mar. 17, 1958
East Coast	44.5	41.5	New York barge price for Bunker C
Avg. 150,000 bbl. per day	36.0	37.0	Some gas used at Gulf Coast
Mid-Continent	20.0	21.0	Primarily natural gas

Total labor. The total number of workers employed in refineries is published each month by the U. S. Department of Labor. This was checked for the average operation by summing the number of employes associated with the various process operations, maintenance, utilities, etc. Major refinery managements use many more employes than independent refinery managements (Process Costimating No. 44, OGJ, April 6, 1959). Total employes for each refinery are also shown in Table 3. Wage rates are substantially the same in refineries over the entire United States, being slightly lower on the East Coast and being slightly lower for major company employes. However, major operators pay larger fringe benefits (about 29% as against an average of 27% for the entire industry and against about 18% for independent operators), and in addition the major operator employs a larger percentage of supervisory and technical workmen. These factors together result in a higher average wage rate for major operators and a larger labor cost:

	Wages, dollars per week*		Labor cost, cents per bbl.	
	1956	1958	1956	1958
Average U. S. capacity	138.50	145.50	50.2	53.4
Average 150,000 bbl. per day	145.00	150.70	53.2	56.1
Fuel-type 150,000 bbl. per day	141.70	147.90	40.7	46.6
Fuel-type 20,000 bbl. per day	126.00	130.50	25.9	29.3

*Including ratio of productive workmen to other workmen and the cost of fringe benefits.

Purchased power. The total power requirement was computed for each refinery by summing the power required by each process and operation. The heat required for gas-engine power (compression) was included in the refinery fuel (see above). All other power was considered as electrical power (including the driving of air blowers). The total amount of purchased power for average U. S. refineries is published each year by the U. S. Bureau of Mines. When the electrical-power requirements computed herein are reduced by the amount of power generated in the refinery, the remaining power that must be purchased checks almost exactly with the Bureau of Mines' figure.

Electrical-power prices to refiners have been somewhat as follows (Process Costimating No. 14, May 26, 1958):

	Mills per kw.-hr.	
	1956	1958
Entire U. S. (refiners)	8.5	8.8
Mid-Atlantic (East Coast)	9.0	9.33
Mid-Continent	7.74	8.02
For 150,000 bbl. per day average refineries	8.6	8.9

Maintenance materials. The total cost of maintenance (per cent per year of replacement cost) was estimated by weighting the percentages for various process operations and raising the percentage by 0.5% for the handling of high-sulfur crude oils (the 150,000-bbl. per day plants). Maintenance labor has already been included as part of total labor and hence the percentage of the maintenance cost that is due to materials is all that is included here (see Table 3). Independent refiners use much less maintenance labor, although about the same amount of maintenance materials.

Capital investments were computed (see 1957 Costimating Series, OGJ) from the amounts and kinds of processing conducted in each refinery.

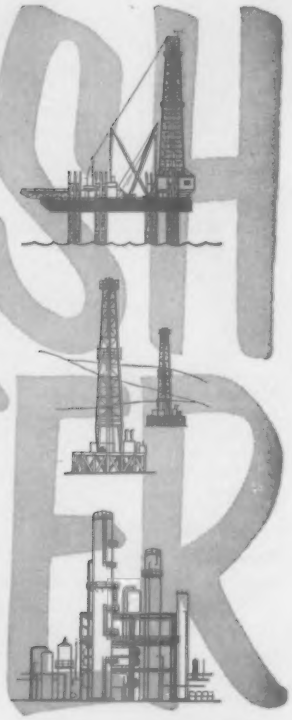
Chemicals and tetraethyl lead. The use and cost of chemicals and catalysts has been outlined in several issues of Process Costimating (Chemicals used for Various Processes, No. 62, Dec. 7, 1959, p. 143; An Indication of Chemical Consumption, No. 64, Jan. 11, 1960, p. 97; Approximate Price Indexes of Chemicals, No. 58, Oct. 12, 1959, p. 186; Tetraethyl Lead Consumed, No. 68, Mar. 21, 1960, p. 127; Approximate Annual Consumption of Chemicals, No. 7, Apr. 25, 1960, p. 210; Chemical Consumption from the Literature, No. 72, May 30, 1960, p. 109; and Cost of Chemicals Outside the U.S.A., No. 74, June 27, 1960, p. 122). These data are kept up to date for use in the Nelson Refinery Operating Cost Indexes which are

TABLE 3—VARIOUS QUANTITIES, FACTORS, ETC., USED IN ESTIMATING THE OPERATING COSTS OF TYPICAL REFINERIES

	Average operation*		Average 150,000 B/D		Fuel-type 150,000 B/D		Fuel-type 20,000 B/D	
	1956	1958	1956	1958	1956	1958	1956	1958
Heat required, M.M. B.t.u./bbl.	0.575	0.637	0.570	0.633	0.650	0.729	0.628	0.757
Heat required for steam	0.140	0.155	0.162	0.168	0.140	0.162	0.124	0.146
Heat required, total, M.M. B.t.u./bbl.	0.715	0.792	0.732	0.801	0.790	0.891	0.752	0.903
Less—Coke and gas fuel credit	0.305	0.319	0.298	0.313	0.346	0.383	0.346	0.436
Purchased fuel, M.M. B.t.u./bbl.	0.410	0.473	0.434	0.488	0.444	0.508	0.406	0.467
Steam, lb. per bbl.	140	155	162	168	140	162	124	146
Process gas, M.M.s.c.f.d.†	12.8	15.2	62.4	74.8	73.9	90.7	9.7	13.2
Men, total per 10,000 B/D	254	257	257	261	201	221	144	157
Men, nonproductive	88	95	91	99	70	82	36	39
Fringe benefits, % of wages	27	29	30	31	30	31	18	18
Electrical power, kw.-hr./bbl.	3.89	4.29	3.98	4.32	4.40	4.86	4.23	4.74
Generated in refinery	1.45	1.61	1.73	1.79	1.53	1.77	0.37	0.39
Purchased elec. power, kw.-hr./bbl.	2.44	2.68	2.25	2.53	2.87	3.09	3.86	4.35
Compressor, hp.-hr./bbl.‡	1.98	2.38	2.14	2.52	2.66	3.26	2.1	2.84
Maintenance, %/yr. of replacement	5.3	5.0	5.8	5.5	5.9	5.6	5.4	5.1
Material, % of maintenance	45	43	45	43	45	43	55	52
Replacement cost, $/daily bbl.	937	1,025	1,210	1,260	1,035	1,140	730	1,075

*These costs are simply the average cost in the U. S., and they do not apply to a 30,000-bbl. per day plant even though the barrels processed per refinery was 30,000. †Wet gas to gas recovery. Part is used for hydrogen treating. ‡Power derived from gas engines is included in refinery fuel.

FRESH WATER



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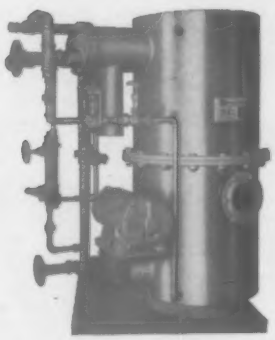

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published in the first issue each month of The Oil and Gas Journal. Consideration of the kinds of processing involved in the plants studied herein permitted the estimation of the relative costs of chemicals used in Table 1.

Other cost items. The cost of purchased water is not included but its cost is very small.

The other items are ones that can vary considerably depending on the policies of various refinery managements or on the accounting methods employed. However, they are costs that must be recognized by refinery management. Although the average insurance and property taxes reported in the literature amounts to 1.73% of investment, some authorities have used only 0.05% whereas others have used over 3%.

The item for interest or dividends indicates that capital must pay an interest rate or stockholders must receive a dividend—or if the investment has been written off, the value of the plant could be earning interest if it were invested elsewhere. Depreciation is not included because it has become simply a bookkeeping entry used mainly for tax purposes and because if properly maintained, a refinery never becomes so useless that it must be discarded. However, an improvements and obsolescence charge (Process Costimating issues No. 88, Feb. 6, 1961, p. 109, Frequency of Processing Charges; No. 86, Obsolescence in Refinery Processing; Jan. 2, 1961, p. 86, and No. 97, June 26, 1961, p. 153, Capital Expenditures) is included. Refiners must either pay royalties or conduct enough research to establish a patent position. This cost amounts to about 3 cents per barrel (Process Costimating No. 7, OGJ, April 7, 1958). Such costs cannot be avoided and hence they must be considered as an operating cost rather than as new investments.

The costs shown herein are not basically at variance with somewhat similar costs shown in Process Costimating No. 1 and No. 5 (OGJ, Feb. 24 and Mar. 24, 1958). However, fuel cost as used herein, is for purchased fuel whereas in the earlier issues, fuel cost included the value of coke on catalyst and refinery process gases (meaning that these were considered as products from the crude oil and as such had a product value).

Since the articles were published, superior information has become available resulting in a correction of the cost of purchased electricity during 1956 (2.45 cents rather than 2.1 cents herein), a correction in the cost of chemicals (20.1 rather than 21.9 cents), and a change in the cost of royalties (3.2 rather than 1.16 cents).

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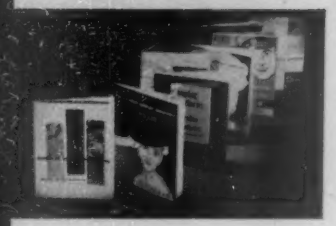

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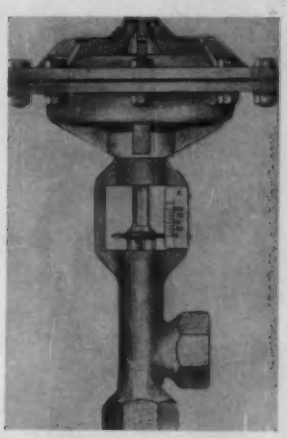

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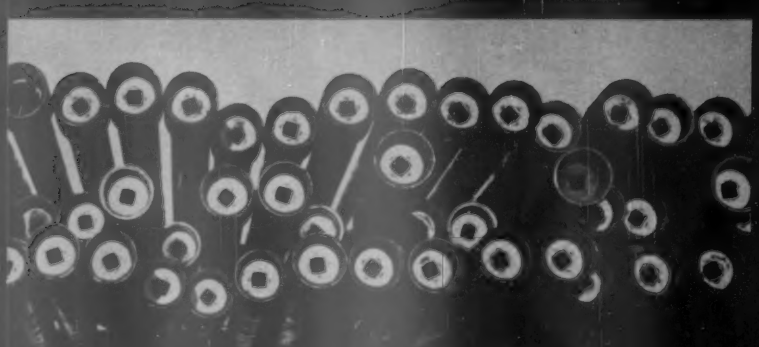

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W-K-M Cross Type Multiple Completion Gate Valves

These compact multiple gate valves cost less than equivalent components and provide all of the service-proved features of regular W-K-M®Gate Valves such as non-lubricated operation, Teflon* seat inserts for double-tight sealing, and parallel expanding gates for a positive up and downstream seal.

W-K-M Cross Type Gate Valves are available for dual, triple and quadruple completions. Specify W-K-M — at leading supply stores everywhere. Write for Catalog 200. W-K-M Division of ACF Industries, Inc. P. O. Box 2117, Houston, Texas.

*DuPont's tetrafluorethylene resin

When So Much Depends on a Valve . . . Specify W-K-M.

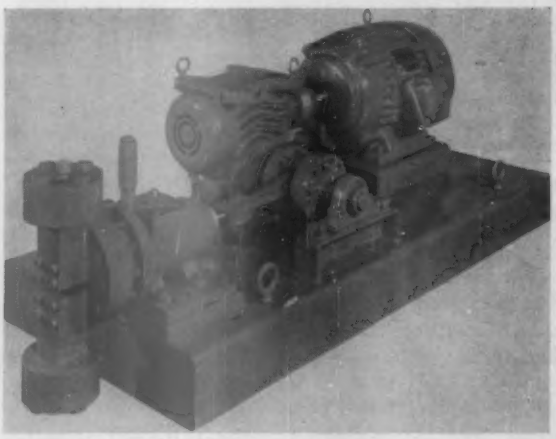
W-K-M DIVISION

ACF INDUSTRIES

Cutter keeps right-of-way clear

BRUSH with diameters to 3 in. can be cut with a new rotary cutter. The Model CY-60 machine features a high-speed gear box so towing vehicles can move fast, yet obtain a clean cut.

Specifications include ½ by 4-in. rotating offset blades and a 3/16-in.-thick steel "stump-jumper" type of round-blade carrier. The cover is 3/16 in. thick, and the side plates measure 8 in. deep. The machine comes in both lift and pull models, with dual wheels on the side, or to the rear of the pull type. Source: **Servis Equipment Co.,** Box 1590, Dallas, Tex.



Pump slurries at 3,000 psi.

A NEW DIAPHRAGM TYPE of pump has been brought out to move corrosive slurries at pressures up to 3,000 psi. and flow rates to 6 g.p.m.

Design features of the Model 150-7 pump include a barrier diaphragm that separates all working parts from the fluid handled. An actuating fluid between a piston and the diaphragm is used to exert the pumping force on the diaphragm. All pump surfaces that contact pumped fluid are of Teflon or inert metal.

The valve design comprises a spring-loaded, guided cone that seals on a hardened edge. Other features include a cast-steel water-cooled housing for high-temperature and high-pressure service and an adjustable stroke to permit variation of pumping rate. The pump weighs 870 lb. and measures 2 ft. by 4½ ft. by 1 ft. 8 in. high. Source: **Keystone Engineering Co.,** Box 14366, Houston 21, Tex.

•

Float-operated tank gage

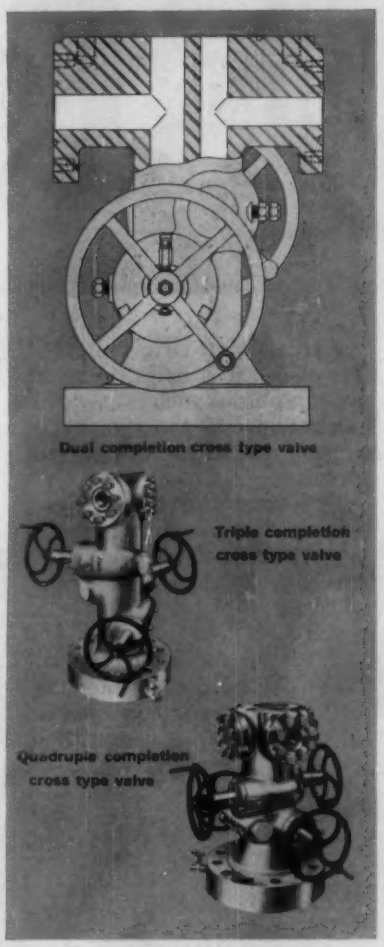
Large dials on this float-operated tank gage make readings easy to see. The gage, called the Dir-O-Gage, is suitable for bolted or

W-K-M

Multiple-Completion Valves

W-K-M Multiple-Completion Valves are built with Teflon seat inserts for dead-tight sealing, pressure-seal bonnets, superfinished stems equipped with roller bearings, and sealing surfaces protected from the flow.

Sizes: 1¾" and 2"
Working pressures: 2000, 3000, and 5000 lbs.



W-K-M DIVISION

ACF INDUSTRIES

HEVIWATER
completion fluid avoids use of mud

Since inhibited Heviwater* is free of solids, it helps operators avoid problems such as pay contamination and the sticking of packers due to the settling out of solids.

Heviwater can be furnished pre-mixed or it can be mixed at the well site using rig equipment. Dowell supervision for mixing is available upon request at no cost.

This table shows the materials which can be used, in addition to fresh water and corrosion inhibitors, to provide various fluid weights of Heviwater:

FLUID WEIGHT (LBS/GAL)	MATERIALS USED
8.33-10.0	NaCl
8.33-11.0	NaCl + $CaCl_2$
8.33-11.8	$CaCl_2$
11.8 -14.0	$CaCl_2$ + $ZnCl_2$

Heviwater can be made available wherever this type of completion fluid is needed. Ask your Dowell representative for full information. *DOWELL TRADEMARK

PRODUCTS FOR THE OIL & GAS INDUSTRY

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

welded lease-storage tanks up to 24 ft. high. It comes complete with all components and hardware for installation.

No air pressure or electrical power is needed for the gage. A Neg'ator motor built into the gage head provides the power to wind and unwind the tape as the float follows the fluid level. Source: **Instruments, Inc.,** Box 556, Tulsa, Okla.

●

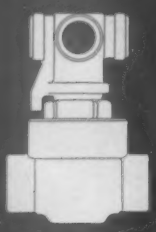
New skid-mounted LACT unit

Only four pipe connections are needed to hook up this LACT unit capable of handling up to 3,200 bbl. a day of oil. Measuring 4 ft. wide and 8 ft. long, it can be transported on a pickup truck.

A variable-volume positive-displacement pump charges the meters at varying rates, without changing the pump speed. A manual adjustment on the pump changes the rate.

The pump start and stop controls for high and low level are mounted on a standpipe which is an integral part of the unit. Gage glasses on the standpipe show the exact level of fluid in the surge tank, as the standpipe is equalized into the surge tank. A connection in the top of the standpipe permits installation of a lease-shutdown switch.

Other features include a plug-in B.s. and w. monitor and meter-speed sensor and a proportional-flow automatic sampler. Source: **J. A. Halpine & Son, Inc.,** Box 6147, Tulsa, Okla.



TEXSEAL
by Texsteam

a precision-built ***PLUG-VALVE*** that eliminates costly lubrication

USING lubricated plug valves means needless extra expense. This simple test will show you why: First add up the costs of lubricants, lubricating guns, maintenance, lubricant inventories, and many other expenses that arise from year around use of "thirsty" lubricated plug valves. Then compare these costs and the price of the valve itself, to that of the improved TEXSEAL non-lubricated precision valve which *never* needs lubrication.

Consider too, the extra quality points of the light-weight TEXSEAL, such as compact size, round port, preloaded plug (for easy operation), bubble-tight sealing, free-floating, self-aligning, replaceable seats, in-the-line repair and temperature compensation.

Since we're talking economy, remember it costs nothing to check up on our boasts. So write for a free catalogue with all the information. It's our guess you will choose TEXSEAL next time you buy.

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A SUBSIDIARY OF VAPOR HEATING CORPORATION
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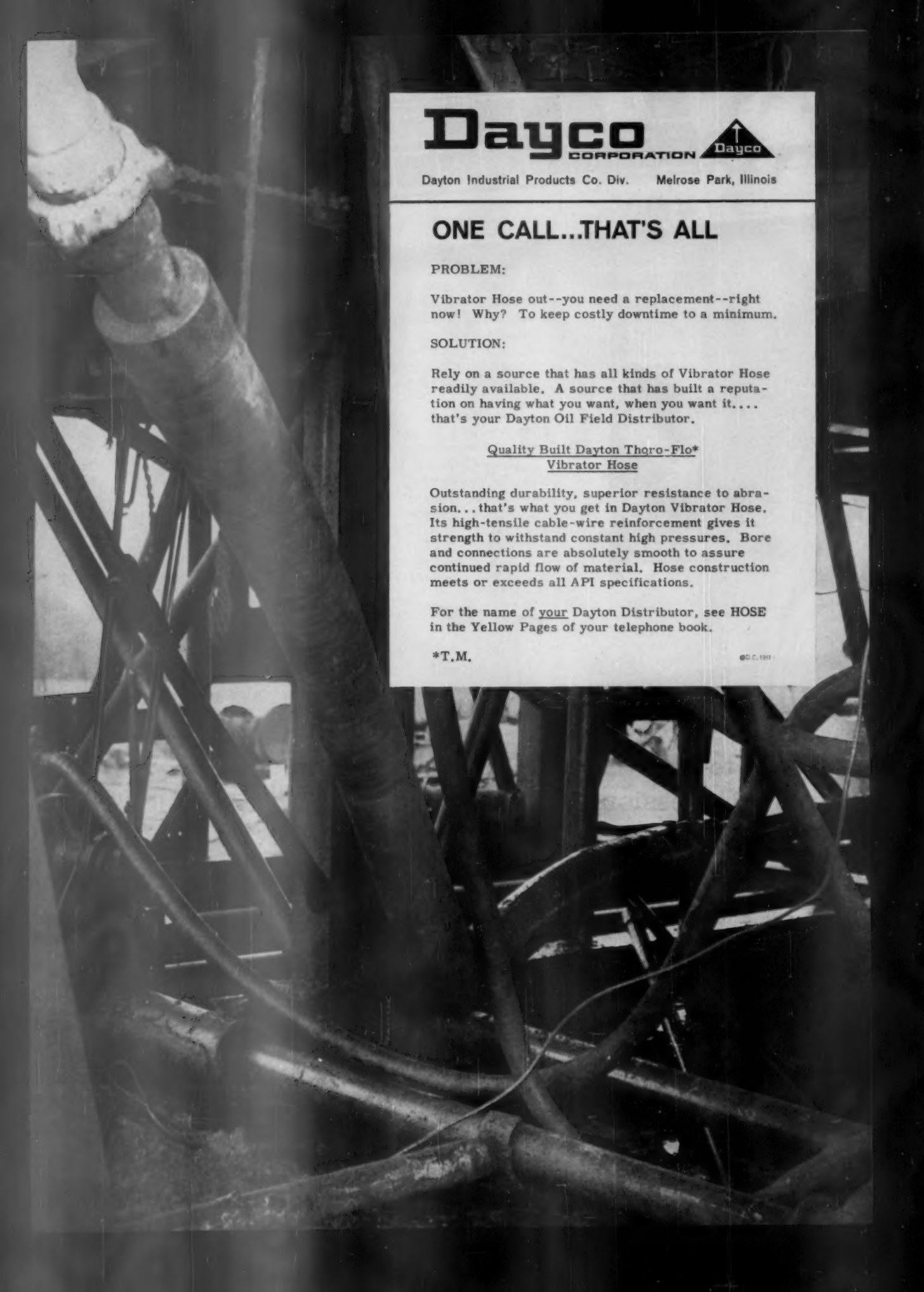

Dayco CORPORATION

Dayton Industrial Products Co. Div. Melrose Park, Illinois

ONE CALL...THAT'S ALL

PROBLEM:

Vibrator Hose out--you need a replacement--right now! Why? To keep costly downtime to a minimum.

SOLUTION:

Rely on a source that has all kinds of Vibrator Hose readily available. A source that has built a reputation on having what you want, when you want it.... that's your Dayton Oil Field Distributor.

Quality Built Dayton Thoro-Flo* Vibrator Hose

Outstanding durability, superior resistance to abrasion... that's what you get in Dayton Vibrator Hose. Its high-tensile cable-wire reinforcement gives it strength to withstand constant high pressures. Bore and connections are absolutely smooth to assure continued rapid flow of material. Hose construction meets or exceeds all API specifications.

For the name of your Dayton Distributor, see HOSE in the Yellow Pages of your telephone book.

*T.M.

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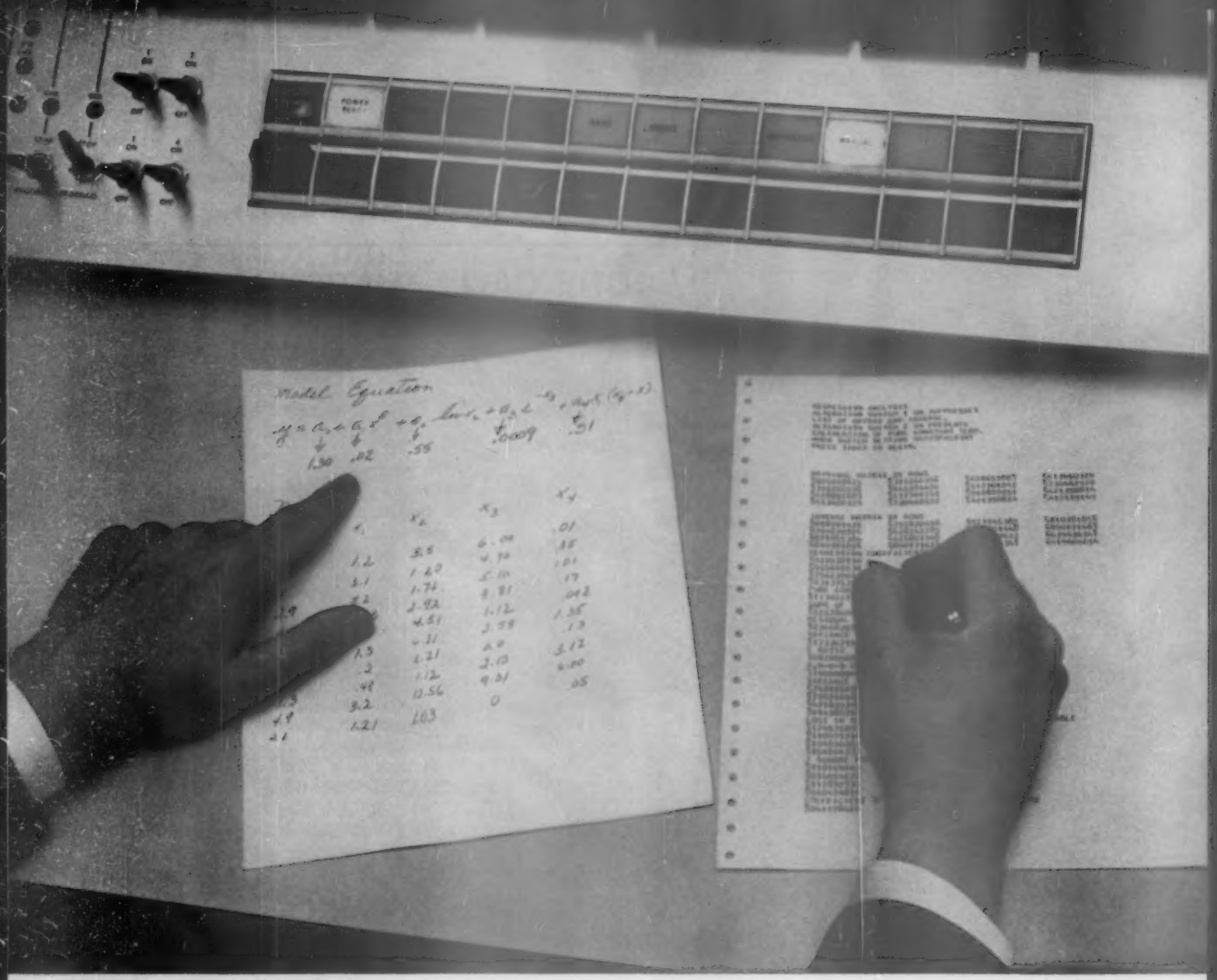

Want to find the coefficients? It's easy with the new Regression Analysis program for the IBM 1620

Here's another program offered free-of-charge to users of the IBM 1620 Data Processing System. It gives you the kind of results you might expect only from a much more expensive computer. But users of the 1620 know that its low rental cost is deceptive. The 1620 packs *more computing power per cubic inch* than any other computer in its size range.

The Regression Analysis program is a good example. Suppose you want a fit for production purposes. If you employ more than two variables you probably have difficulty visualizing the representation of your data. If linearity is not the case, you must often guess blindly at a polynomial of high degree, accept or reject the fit with something approaching a sixth sense, and either try again or settle for the results you have.

The new Regression Analysis program lets you handle expressions containing up to *24 variables*. If you have the even more complicated task of handling many dependent variables, the program will generate regression coefficients with a maximum number of dependent variables not exceeding one-half the number of independent variables.

This program will also fit non-linear functions and hyper-surfaces. Compare this performance with that of any other computer in the 1620's price range.

A basic 1620 installation rents for just $1600 per month. For details, contact your local IBM Representative.

IBM's 1620 is a compact desk-size computer.

IBM®
DATA PROCESSING

Single-stage centrifugal pump

High interchangeability of pumps and parts are featured in a new line of single-stage centrifugal pumps just brought out and designed especially for refineries and petrochemical plants.

The pumps can handle liquids or slurries at temperatures from −350° to 500° F. They come in capacities to 775 g.p.m. and heads to 300 ft. All pumps in the group feature top center-line discharge.

One particularly interesting feature is that all pump sizes have the same over-all length: 23 in. And one coupling (1⅛-in.) fits all sizes.

The top center-line discharge is self-venting. The back-pullout design of the pumps permits worn parts to be replaced without disturbing the pipe connections or motor mounting. Source: **Goulds Pumps, Inc.**, 220 Black Brook Rd., Seneca Falls, N. Y.

•

New lining for cat crackers

The refractory castable material, called One Shot, was developed to give the important characteristics of both lightweight refractory material and hardfaced, dense castable material in one product, so that the use of a dual lining is unnecessary. The product can be cast or gunned in place.

According to the manufacturer, the material can be used successfully in the regenerator-cone sections of fluid catalytic cracking units, in the main areas of cat cracker reactors and regenerators, in vaporizer towers, heaters, and stacks. Its density is 94 lb. per cu. ft. after drying at 220° F. It comes in 50-lb. bags ready for mixing. Source: **Kaiser Aluminum & Chemical Corp.**, Kaiser Center, 300 Lakeside Dr., Oakland 12, Calif.

"Curses! There's COLMONOY hard surfacing everywhere!

Even on NEW washpipes!"

The Colmonoy Spraywelder applies powdered nickel-base alloys smoothly and quickly. Overlays are fused and ground.

Washpipes in hydraulic jarring tools take about the worst "wear and tear" of any oil field equipment. That's why Bowen Itco, Inc., hard surfaces its washpipes with Colmonoy No. 6. Colmonoy overlays resist corrosion/abrasion, do not gall, have a low coefficient of friction—thus provide oil field parts (new or old) with longer life.

Why don't you try Colmonoy alloys and methods to solve your problems of excessive wear? Request the Spraywelder Catalog and Hard Surfacing Manual No. 79. We can also recommend a shop doing Colmonoy work near you.

HARD-SURFACING & BRAZING ALLOYS

WALL COLMONOY CORPORATION
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NEW
MACCO HOT OIL VALVE

Provides Economical De-Waxing Injection Directly Into Tubing At Any Known Depth

MACCO NORMALLY CLOSED CHECK VALVE
MACCO NORMALLY CLOSED CHECK VALVE
MULTIPLE SEATING ARRANGEMENT METAL TO RESILIENT DISC (CAPABLE OF RESISTING 700° F.) & METAL TO METAL
INCONEL STRESS EQUALIZED SPRING
MACCO HOT OIL INJECTION VALVE
ADJUSTABLE PEDESTAL FOR ADJUSTING LOAD RATE ON SPRING

Easily installed down-hole at any point desired for circulation of hot oil, the new MACCO Hot Oil Valve is the most economical method of combating paraffin. It makes positive treatment possible without pulling rods. Eliminates heat waste. Spring-loaded and in series with two reverse flow check valves, presure is pre-set to be greater than well pressure. Thus, hot oil can not enter casing annulus until a surface pump has built up the differential pressure. Pressure settings are not affected by hot oil or temperatures. Pressure settings are determined by individual well conditions.

Valve and checks are constructed of stainless steel or monel for corrosion resistance. Spring is square, heavy-duty inconel wire to withstand well temperatures and corrosion.

New Macco Hot Oil Valves are available in wide range of pressure ratings and two standard sizes: 1" and 1½" O. D. Special sizes and pressures available on request.

More information and a complete analysis of your problem is available from your Macco Distributor or by writing Macco Oil Tool Company, Inc., P. O. Box 7288, Houston 8, Texas

TIME TESTED MACCO PRODUCTION EQUIPMENT

FLY UNITED JETS TO THE AMERICAN PETROLEUM INSTITUTE CONVENTION

CHICAGO, NOVEMBER 13-15

With the world's largest jet fleet, United Air Lines offers jet service to Chicago from more U. S. cities than any other airline.

If you should want to bring display material with you, use United's exclusive Passenger Reserved Air Freight Plan. Your equipment travels on the same plane with you, at rates less than you'd pay for excess baggage.

And if your wife is traveling with you, you can save on her First Class fare with United's Red Carpet Family Plan.

Best of all, from reservation to destination, United takes *Extra Care* with every detail of your trip. See your Travel Agent or call United Air Lines.

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WORLD'S LARGEST JET FLEET
THE EXTRA CARE AIRLINE

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Luxurious accommodations . . . superb cuisine . . . impeccable service . . . distinctive decor — these are The Columbus, Miami's distinguished downtown bayfront hotel . . . choice of discriminating travelers the world over.

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TOP O' THE Columbus
Miami's distinguished dining rendezvous

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PRESSURE GAUGE

THE FIRST ACCURATE PRESSURE GAUGE For Applications Requiring . . . RUGGEDNESS and DEPENDABILITY

CAPACITIES:
3,000, 5,000,
6,000, 10,000,
15,000 PSI
Metric Equivalents
Available.

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World's principal manufacturer of Oil Well Drilling Instrumentation

INCREASE PROFITS WITH REDA Submergible PUMPS

REDA GIVES YOU THESE COST SAVING FEATURES AND DOES THE JOB BETTER!

- Lower cost for installation, operation and maintenance.
- 250 to 18,000 BPD capacities
- Depths to 10,000 ft.
- Corrosion-resistant construction
- Long life — dependable service
- A complete line to meet pumping requirements

and

INVESTMENT COST IS FAR LOWER WHEN YOU CHOOSE REDA FOR YOUR PUMPING NEEDS.

Write or call for more information. Reda engineers will be pleased to assist and help plan your operations.

SIGN OF QUALITY SUBMERGIBLE REDA PUMPS

REDA PUMP CO.
BARTLESVILLE, OKLAHOMA

Manufacturers of submergible motors and pumps for over 35 years — for oil, brine and water wells, gasoline and jet fuel

Machine bores 36-in. holes

Up to 150 ft. of 36-in. hole or 200 ft. of 12-in. hole can be bored under roads, railroads, and highways with a new gasoline-engine-powered horizontal boring machine. The Model Ka-Mo G-160 machine consists of a 52-hp. air-cooled gasoline engine, hook, rollers and engine base, three-speed transmission and gear reducer with clutch, 9-g.p.m. hydraulic pump that powers the feed mechanism, leveling outriggers, track, and connecting plates.

Design features include power-driven feed to eliminate dangers associated with anchors, accurate control for maintaining grade and line, variable speed to meet varying formation conditions, and strong construction to withstand rock boring. Source: **Kwik-Mix Co.,** 235 W. Grand Ave., Port Washington, Wis.

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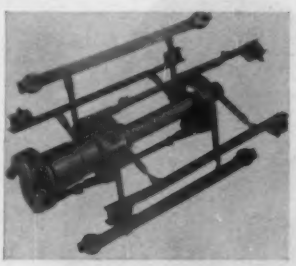
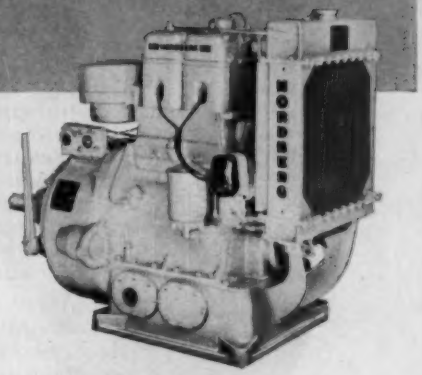


Internal pipe cleaner

No rotation of pipe is required when it's internally cleaned with this machine, called a Spin-Blast. It comprises a nozzle head, feeder tube, governor, bearings, seal, seal-adjusting screw and governor housings, and bearing and seal.

The machine is designed to remove rust, paint, carbon, mill scale, and other deposits from pipe in sizes from 6 to 36 in. i.d. The maker says all types and sizes of abrasives, in-

POWER CHIEF® Oil Field Engines Now Sold and Serviced by SONDO SALES



When you have a power problem, your best bet is specialized experience and service from a company whose only business is *power* — power for production pumping, water flooding, rig lighting, microwave communication, and other oil field power needs.

Nordberg sales and service facilities for Power Chief Diesel and Gas Engines have now been expanded by the recent appointment of *Sondo Sales Company*, Tulsa, Oklahoma, as distributors for these heavy duty, medium speed units throughout the oil fields. Maintaining offices and warehouses in Tulsa, Pampa, Texas and Great Bend, Kansas, Sondo has 16 field men on the job to make sure your power problems are solved promptly and efficiently.

Since the only business of Sondo Sales is concentrated on the sales and service of Power Chief Engines, you can be sure of specialized attention. Call them today or write for bulletins on Power Chief Diesel Engines and Power Chief Gas Engines. These heavy duty oil field engines are available in 1, 2 and 3 cylinder sizes with power to 54 hp or 30 kw.

NORDBERG MANUFACTURING COMPANY
Milwaukee 1, Wisconsin

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WAGNER® MOTORS AT WORK

power to pump petroleum

Special Wagner® oil well motors consume fewer kilowatts per barrel pumped

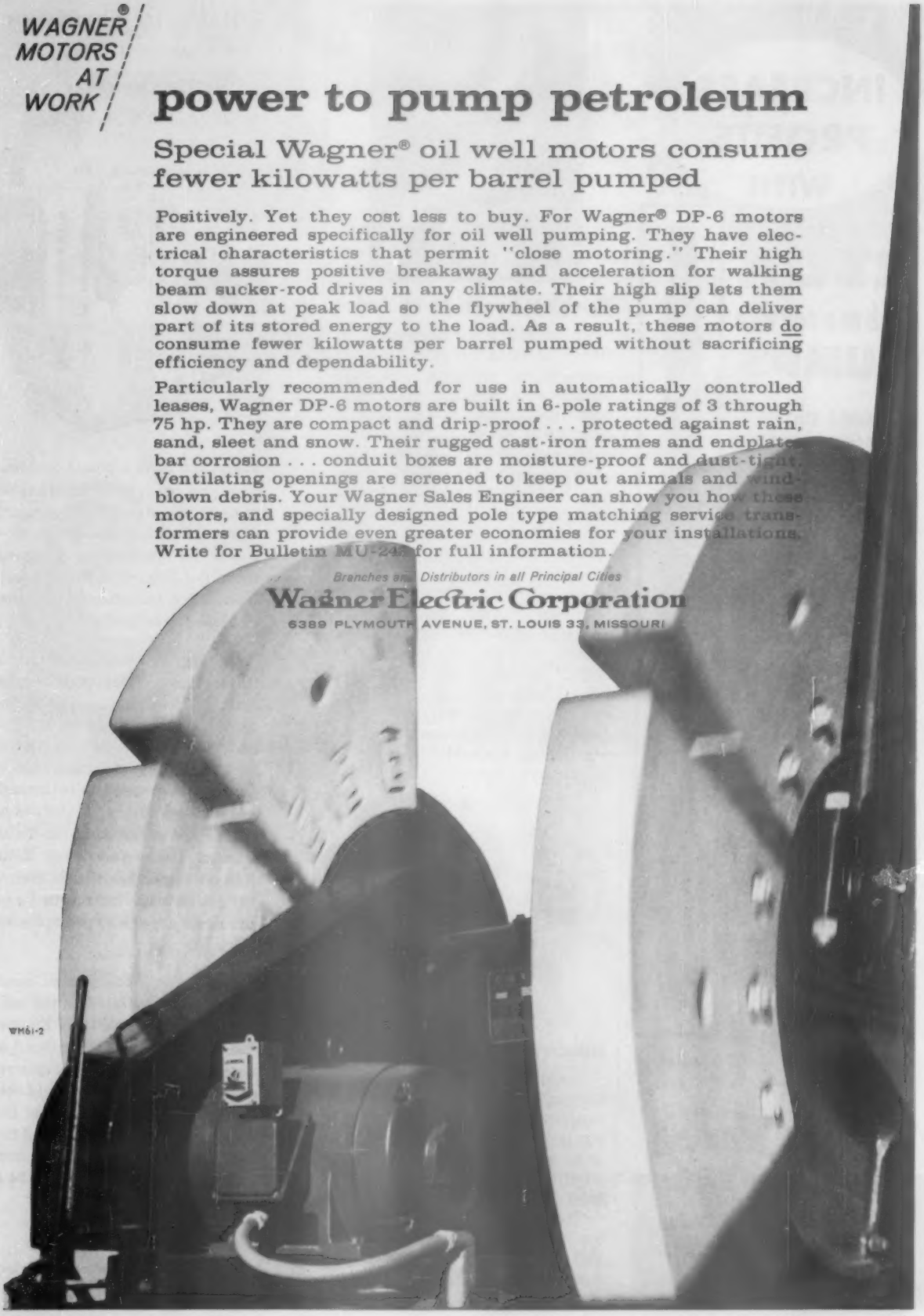
Positively. Yet they cost less to buy. For Wagner® DP-6 motors are engineered specifically for oil well pumping. They have electrical characteristics that permit "close motoring." Their high torque assures positive breakaway and acceleration for walking beam sucker-rod drives in any climate. Their high slip lets them slow down at peak load so the flywheel of the pump can deliver part of its stored energy to the load. As a result, these motors do consume fewer kilowatts per barrel pumped without sacrificing efficiency and dependability.

Particularly recommended for use in automatically controlled leases, Wagner DP-6 motors are built in 6-pole ratings of 3 through 75 hp. They are compact and drip-proof . . . protected against rain, sand, sleet and snow. Their rugged cast-iron frames and endplates bar corrosion . . . conduit boxes are moisture-proof and dust-tight. Ventilating openings are screened to keep out animals and wind-blown debris. Your Wagner Sales Engineer can show you how these motors, and specially designed pole type matching service transformers can provide even greater economies for your installations. Write for Bulletin MU-245 for full information.

Branches and Distributors in all Principal Cities

Wagner Electric Corporation

6389 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI



WM61-2

cluding peening shot, may be used.

A mixture of air and abrasive is forced out two nozzles as the head rotates and blasts the abrasive around the inside of the pipe. Source: **Clemtex, Ltd.**, P. O. Box 15214, Houston, Tex.

•

Two new tool joints

The tool joints come in 2⅞-in. Type PAC and 1¼-in. Type MT sizes. The Type PAC has an open-hole thread form of four threads per inch with a 1½-in. taper per foot. It's designed to be installed on 2⅞-in. internal upset drill pipe and can flash to external-upset pipe.

The Type MT joint was designed to be installed on 1.660-in. o.d. tubing for such service work as drilling out cement, packers, and other requirements. It has six threads per inch on a 1½-in. taper per foot. The joint is friction-welded to the tube and can be installed on any plain tube of any wall thickness. Source: **American Iron & Machine Works,** 518 N. Indiana, Oklahoma City, Okla.

•

Strip indicates if drill hose twisted

A white strip runs the length of a new rotary drilling hose so a driller can tell at a glance if the hose is twisted in the derrick.

Designed to exceed API pressure requirements for Class C rotary hose, the product comes with a 3 and a 3½-in. i.d. Four-ply, single-wire construction is used. A neoprene cover protects the hose from corrosive muds, gases, and foams. Source: **Continental-Emsco Co.,** Box 359, Dallas, Tex.

Darcova 45° Bevel Type Pumcup

Darcova Pumcup

put Pumcups in your cylinders

TO HOLD PRESSURE LONGER!

In Darcova Pumcups a sound engineering principle has been combined with precision tolerances and extremely durable compositions to provide exceptional efficiency and life in hydraulic, air, and reciprocating pump cylinders of all kinds.

Unlike ordinary piston packing, precision Pumcups are engineered to minimize friction load while hugging cylinder walls on every pressure stroke. Regardless of eventual wear, efficiency *stays* high! So there's far less down-time and need for replacement.

Pumcups are made in a wide range of sizes, types and texture-engineered compositions, including 100% Nylon, for all kinds of pressure-temperature-fluid conditions. Send for Pumcup Bulletin 5903 and weigh all the facts!

DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP
TRADE MARK
PUMCUPS

S. E. HUEY & CO.

ENGINEERS & SURVEYORS

BERNHARDT BLDG.

MONROE, LA.

SURVEYING & MAPPING

PIPE LINE SURVEYS

What's NEW

. . . in literature

Flexible joints for cryogenic piping

Just published is this new four-page catalog on flexible ball joints for handling liquid oxygen, liquid methane, and other cold-temperature liquids and exotic fuels. Catalog 233-B offers specifying information on the new Featherweight series of stainless-steel flexible ball joints. Included is data on Type FL stainless-steel flexible ball joints, designed for installation in metal fuel lines. Source: **Barco Mfg. Co.,** 500 N. Hough St., Barrington, Ill.

Simplified oil-production systems

Producing wells with two pay zones through a single well bore as though each zone was a separate well, substantially reduces investment cost. Eight-page Bulletin 209 outlines simplified systems to produce both zones from the same well bore without commingling the fluid. These systems permit either or both zones to be flowed, pumped, vented, or treated as necessary for efficient production. When both zones are pumped, a single rod string and pumping unit is used. The bulletin contains a detailed selection chart with pertinent information and parts list for the various systems. Source: **Pacific Pumps, Inc.,** Box 151, Huntington Park, Calif.

Traveling blocks

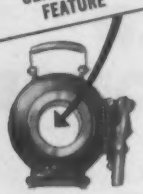
Made in a size range from 125 to 550-ton capacities, the blocks introduce the new Trim-True design. Up to 2,000 lb. of weight have been added over other block designs without increasing outside dimensions. The brochure contains a cutaway drawing which shows internal construction of the blocks. Matching crown blocks are also illustrated. Source: **Gardner-Denver Co.,** Quincy, Ill.

Oil-field pumps

Four-page Bulletin 61-OF-P carries detailed capacity specifications on 2-in. self-priming centrifugal pumps. It contains data on gasoline-

45 HANDY HYDRAULIC HELPMATES for OIL FIELD MAINTENANCE

BOTH HAVE THE FAMOUS "SIMPLEX" CENTER-HOLE FEATURE



Pull or push is right through the hole in the center of the ram which provides its own back-up . . . Simplifies rigging, eliminates torque, makes jobs 6 times faster and easier.

SIMPLEX "RE-MO-TROL" HYDRAULIC JACKS and PULLERS

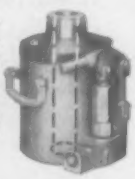
For heavy-duty gear, sleeve and cylinder liner pulling; slush pump repair; pipe and culvert pushing; heavy rigging; leveling and lifting jobs of all kinds.

39 models, 10 to 300 ton capacities, remote controlled hand or powered pumps.

SIMPLEX "JENNY" HYDRAULIC PULLERS (Self-Contained)

Remove and install bearings, sleeves, bushings, liners, gears, pulleys, pinions, pins, on all kinds of machinery and equipment.

6 models, 30 to 100 ton capacities, single and double pump types.



FOR FULL DETAILS Write for Hydraulic Catalog

SIMPLEX RE-MO-TROL UTR-A-TOOL JACKS JENNY POL-TOG

TEMPLETON, KENLY & CO.
2539 Gardner Road
BROADVIEW, ILLINOIS

A. C. Templeton, 5627 Del Roy Drive, Dallas, Texas

W. C. NORRIS

Target ECONOMY • SERVICE • SAFETY

WRITE FOR NEW WELL HEAD BULLETIN P. O. BOX 1739, TULSA

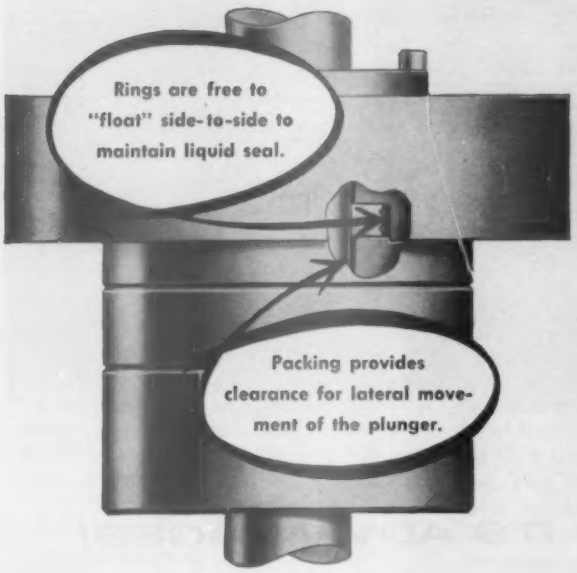
TUBING CASING HEADS

ENGINEERING

NEWS YOU CAN USE ABOUT ENGINE AND COMPRESSOR PERFORMANCE

THIS LIQUID-PUMP PACKING ACTUALLY FLOATS TO ELIMINATE COSTLY LEAKAGE PROBLEMS

Cook's special full-floating, self-adjusting packing boosts performance, reduces downtime of high-pressure plunger pumps


Rings are free to "float" side-to-side to maintain liquid seal.
Packing provides clearance for lateral movement of the plunger.

Plungers of all liquid pumps tend to "run out of true." As a result, conventional packings must make room for this lateral movement with a clearance around the plunger. Thus, a path is soon formed and excessive leakage occurs. This leakage can be reduced by adjustment but soon starts again.

To eliminate this annoying and expensive packing problem, Cook has designed a special liquid-pump packing which has proved itself in a number of varied field applications. This Cook packing actually *floats with the movement of the plunger.* It doesn't have to make room for the "run-out" of the plunger—it simply moves with it!

Cook packings are now successfully handling all types of liquids—oil, water, chemicals, brine, etc.—under many special operating conditions. These self-adjusting packings now make possible trouble-free performance without frequent adjustments. They are adaptable to all new or existing pump designs and become part of the permanent pump assembly. Ask a C. Lee Cook representative to give you the details about this special liquid-pump packing.

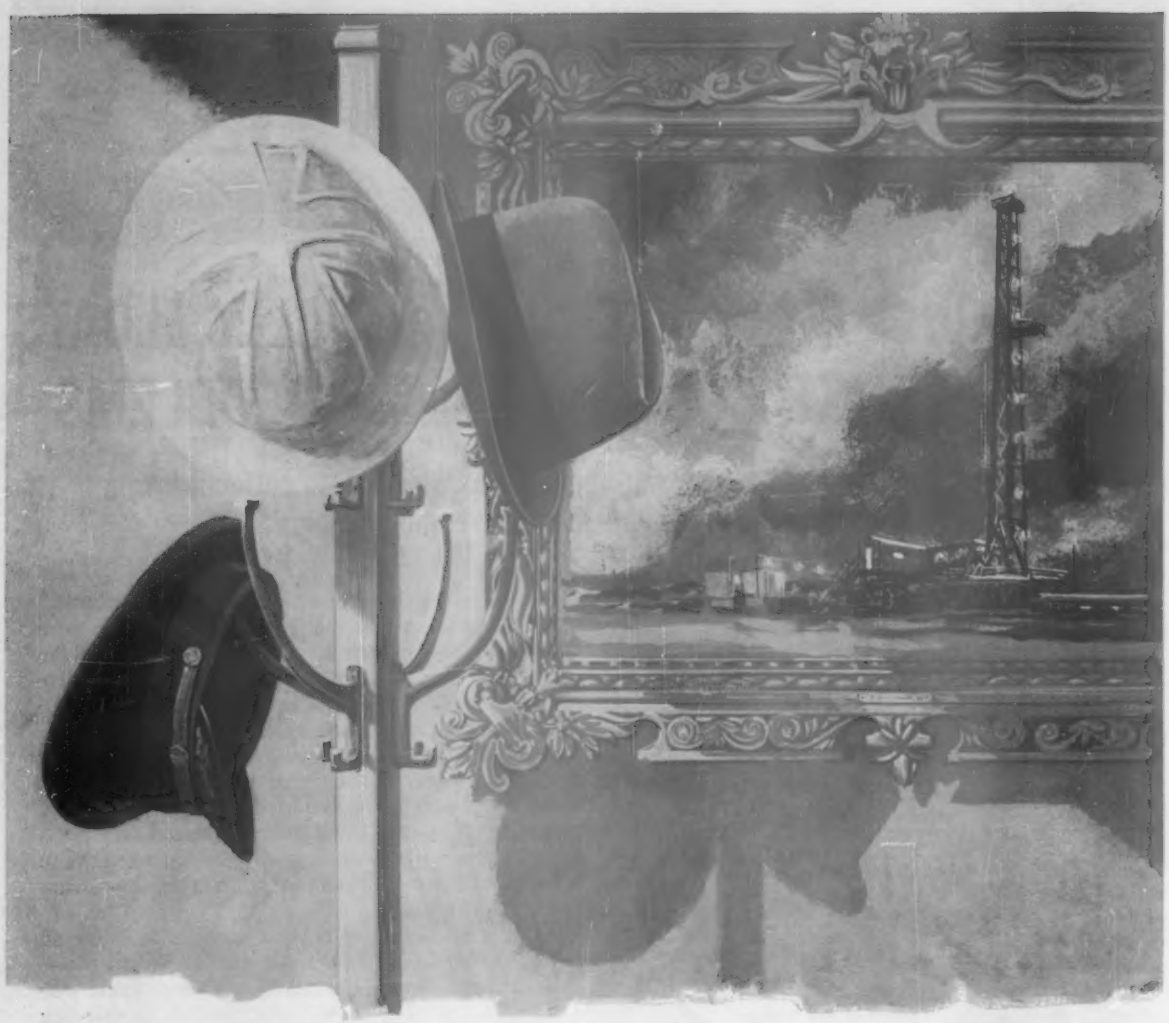
WRITE FOR MORE INFORMATION

If you want Cook engineers to review the special requirements of your specific liquid-pump packing application, just send the necessary details to C. Lee Cook Company, 934 South Eighth St., Louisville 3, Ky. Or send for complete information about any of Cook's complete line of rings and packings.

COOK SEALS LIQUIDS AT EXTREME PRESSURES AND TEMPERATURES

C. Lee Cook has unique experience in the advancement of liquid-seal technology. Recently completed research and development contracts (one with a major airframe and missile manufacturer) have resulted in new concepts of seal design, materials compatibility, friction limitations and sealing efficiency. If yours is a special packing application, call in a Cook representative.

C. LEE COOK
DIVISION OF DOVER CORPORATION
Rings and Packings Since 1888



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For decades, oil and gas men have turned to the Republic for the many varied and special bank services they require. Republic knows you must have accurate fact and figure data, prompt decisions on financing, and frequently, bank counselling with your lawyer on regulations and tax matters.

As a pioneer oil bank in the South . . . with the South's largest Oil and Gas Department, Republic is uniquely equipped by experience, knowledge and resources to give you the complete, specialized service you need.

Doing business with Republic Bank indeed has its advantages and they are in your favor. Next time, talk to Republic, indisputably a leader in the field of oil and gas financing. We're here to serve you.

REPUBLIC NATIONAL BANK
OF DALLAS

"My Bank to the Oil and Gas Man

MEMBER, F.D.I.C.

CAPITAL AND SURPLUS $105,000,000 ★ LARGEST IN THE SOUTH

powered pumps as well as outboard bearing, electric motor, and closed-diaphragm types. Source: **Chain Belt Co.,** 4644 W. Greenfield Ave., Milwaukee 1, Wis.

Aliphatic organic chemicals

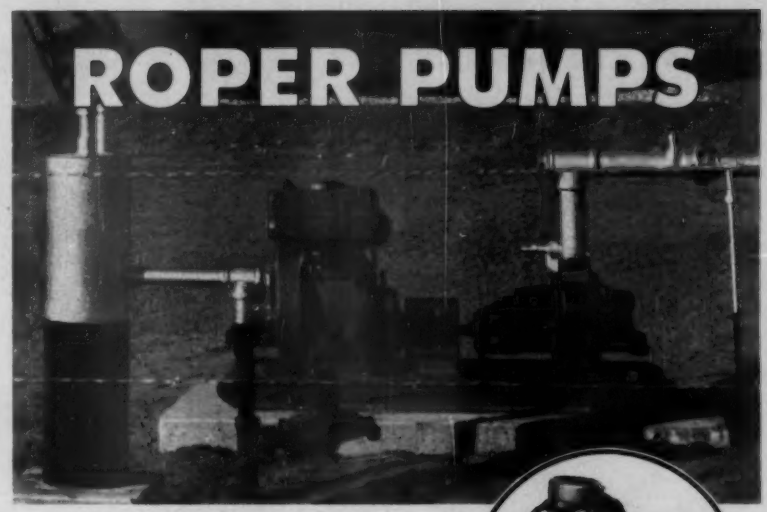
Now being offered free, this new booklet covers the use of aliphatic organic chemicals as additives for gasoline, fuel oil, lubricants, and asphalt. The booklet reviews the application of the chemicals in each area. As gasoline additives, the chemicals are used as anti-icers and corrosion inhibitors; in fuel oil they act as inhibitors and dispersants of sludge; in lubricants they serve as extreme-pressure additives and corrosion inhibitors. Comprising another group, chemicals are used as acid inhibitors. In the asphalt field, the chemicals serve as emulsifiers and anti-stripping agents. Source: **Armour Industrial Chemical Co.,** 110 N. Wacker Dr., Chicago 6, Ill.

Gasoline-sweetening operations

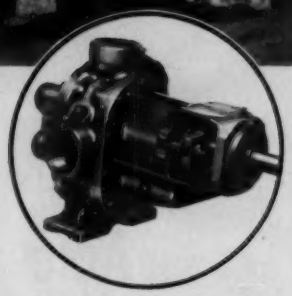
Inhibitor sweetening of gasoline stocks with Tenamene 2, a phenylenediamine-type antioxidant, is described in new Bulletin I-111, just made available. Beginning with definitions, the brochure outlines various methods used in gasoline-sweetening operations. This is followed by a description of materials used and the reaction mechanism which is thought to occur in the inhibitor-sweetening process. Equipment requirements and a flow diagram are included. Source: **Eastman Chemical Products, Inc.,** Kingsport, Tenn.

New corrosion inhibitor

Well-Foam 917 corrosion inhibitor, outlined in Data Sheet TDS-6161-917, is used in "gasified" systems as a supplement to the corrosion protection afforded by the recommended high pH in the liquid medium. On the reverse side of the literature is the tabulatted results of laboratory tests of the material. A second piece of literature, Data Sheet TDS-61561-FAC, is a handy table of concentrations for preparing foaming agent-water mixtures in the field. Concentrations are based upon volumetric proportions



Designed and furnished by Harley Sales Co., Tulsa, Wichita, Houston



SERIES 3600 HB #2

perform general transfer duty at well site

CAPACITIES: 40-300 GPM • PRESSURES TO 400 PSI

At the site of their 14,500-ft. well in Grady County, Oklahoma, the Ohio Oil Co. uses a Roper Series 3600 HB #2 as a general purpose pumping unit . . . pulling from test tanks, circulating and recirculating bottom settlings through treating plant, and general transfer work. This unit is in operation an average of from six to eight hours a day twice a week. Extra durability is built into this oil field pump to make it able to withstand even longer hours of use. This Series 3600 pump handles viscosities from 75-2000 SSU, with variable capacities up to 50 barrels per hour at 50 psi. It is direct connected to a Wisconsin BKN gasoline engine with reduction assembly.

Extra-Margin Quality for Durability

- **Absolute Material Control** — Housing cast from high-tensile, close grain iron.
- **Accurate Machining** — Helical gears mesh perfectly, reducing friction and eliminating vibration.
- **Special Hardening** — Alloy gears are heat-treated and hardened for wear resistance . . . steel shafts are induction-hardened at bearing and packing areas.

For information about your specific pump needs contact your nearest Roper dealer

Send for our new 16-page Series 3600 catalog

ROPER HYDRAULICS, INC.

Dependable pumps since 1857
COMMERCE, GEORGIA

compact POWER for industry

AiResearch Gas Turbine Packages

Packaged by Mission Manufacturing Company, Houston, Texas, the unit pictured above is used for air drilling and is representative of a number of different types of AiResearch industrial gas turbine power packages now available. These lightweight, compact gas turbine packages provide portable compressed air and shaft power for a wide variety of industrial applications.

The basic power package consists of an AiResearch gas turbine compressor and power unit designed around components and accessories proved by laboratory and field testing over a period of years. It is mounted on a skid, enclosed against the weather, with heat exchangers, operating controls and safety devices.

The Mission packaged GTC 105 AiResearch Gas Turbine Compressor Unit pictured above supplies compressed air only. The cutaway Model GTCP 85-91 AiResearch Gas Turbine Compressor and Power Unit provides shaft horsepower and compressed air simultaneously, or either form of power independently and interchangeably. Other models are also available to supply either type of power alone.

AiResearch Manufacturing Division of Arizona is a world leader in the design, development and manufacture of lightweight turbomachinery.

30 to 850 horsepower in a lightweight, compact, dependable package.

Heat at 10,000 to 100,000 Btu per minute in free-flowing air up to 950°F or compressed air from 90°F up to 500°F.

Dependable quick starting under conditions of heavy dust or sand, extreme heat and cold from sea level to 10,000 feet, reaching peak efficiency in seconds.

High pressure, high volume fluid pumping by a compact, portable unit.

Large volumes of compressed air at 30 to 350 psig at 10 percent of the conventional equipment weight.

Shaft power applications for driving pumps, compressors and other mechanical equipment.

Fuel economy competitive with conventional power.

Long service life between overhauls and low maintenance costs.

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AiResearch Manufacturing Divisions

Los Angeles 45, California • Phoenix, Arizona

10,000 AiResearch gas turbines now in use • rugged • versatile • compact • lightweight • dependable

of foaming agent and water. Source: **Well Completions, Inc.,** Box 578, Aurora Station, Denver 8, Colo.

Engineering-management status

Designated Booklet E-9, this is another in a series of "professional advancement" publications written for the engineering profession. Qualities and skills required in successful management, but not necessarily essential to pure engineering, are discussed. The free booklet also brings to light rewards in the area of engineering to be gained for developing further in the area of engineering or for moving into management status. The message points out that some engineers are not psychologically inclined for management capacity, while others would find greater challenge and reward by developing management knowledge. It suggests self-accessment before undertaking training for moving into management classification. Source: **Heat Exchanger Div., Western Supply Co.,** Box 1888, Tulsa, Okla.

Control valves

This comprehensive manual describes pneumatic diaphragm and piston actuators and a wide variety of valve-body assemblies. A 20-page specifying section contains data for selection of a control valve. Included are accessories such as valve positioners, handwheels, and electropneumatic transducers. Bulletin E600, easy to read, is packed with tabulations and listings. Source: **Fisher Governor Co.,** Box 307, Marshalltown, Iowa.

Aid to public speaking

This is another in a series of "professional advancement" booklets. Carrying the field of "human relations" a step farther, Booklet E8 outlines the preparation of a talk to any size group, starting with an outline of the speaker's thought on a subject, anticipating visual-aid requirements in advance, prepublicity, staging, and finally delivery of the talk itself. Prepared for nonprofessional speakers, this 12-page booklet stresses simplicity and naturalness and should prove valuable to speakers and program chairmen. Source: **Heat Exchanger Div., Western Supply Co.,** Box 1888, Tulsa, Okla.

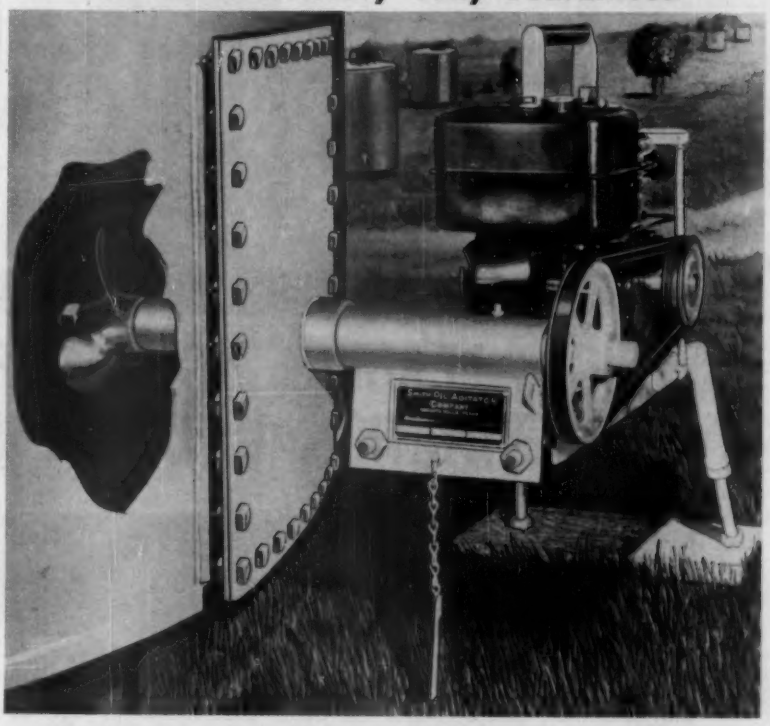
Cleaning, pickling new equipment

Bulletin 51B (two pages) contains a detailed, nine-step typical procedure for pickling of extractor circuits, along with a discussion of in-place circulation cleaning of towers, exchangers, and related equipment. The bulletin also highlights a technical product and use-method description of Oakite 131, an acidic detergent in liquid form, said to be highly effective in removing light oil, rust, and mill scale from new equipment. Source: **Oakite Products, Inc.,** 159 Rector St., New York 6, N. Y.

Tower packings for plants

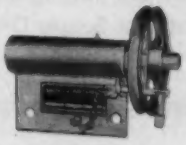
This six-page folder features a full page selection chart, showing types of rings, size range, and materials of construction. Included are drawings of different ring types, along with advantages and applications. Source: **Hydronyl, Ltd.,** 14 Gloucester Rd., London S.W. 7, England.

New Economical Way to Treat Crude Oil
No Heat Necessary—Fully Guaranteed



Blends Oil and Chemicals Settles Water
Reduces Treating Cost Easily Attached to Tanks

A new concept for agitating oil in storage tanks to blend chemicals. Mixes crude oil and chemicals thoroughly in a few minutes and settles water in your tanks, thus making pipeline oil out of tank bottoms and reducing treating costs, eliminating expensive heaters and treaters. Just one Smith power unit can service any number of tanks equipped with Smith agitators.



Pipeline Gaugers Seal

FOR A DEMONSTRATION CALL

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EIGHT LEADING RIG MANUFACTURERS* SUPPLY NATIONAL TORQUE CONVERTERS

And here are the main reasons why: ■ National Torque Converters give you faster hoisting time with smoother, quicker starts and better acceleration of load; ■ Soft control for delicate operation of the drawworks; ■ Pressuring-up of pump with more mud handled and fewer liner changes; ■ Smoother operation in varying formations; ■ Reduced shock on clutches, chains and other equipment. ■ Whether you buy a new rig, or re-power your present rigs, it will pay you to investigate the savings possible with National Torque Converters. Get complete details by writing to National Supply Division, Armco Steel Corporation, Gainesville, Texas.

*Brewster, Continental-Emsco, Gardner-Denver, Ideco, Mid-Continent, National Supply, "Oilwell", Wilson

ARMCO National Supply Division

▶▶▶ Equipment Men Notes

Bethlehem Supply opens store

. . . at Many, La., according to J. V. Spalding, general manager of sales. R. N. Stark is located at Many. T. W. Teague, store manager at Shreveport, and D. O. Thomas, field representative, will work the Many area. Regional manager at Dallas is H. V. Harder.

A. M. Lowrey gets promotion

. . . as industrial distributor sales manager for Thermoid Division of H. K. Porter Co., Inc. In addition he will continue as assistant industrial sales manager. In his new post, Lowrey will work with Thermoid industrial distributors and OEM accounts. He will assist distributors in setting up sales programs and strategy, technical training schools for their sales organizations, provide special marketing data and assistance, and establish better communication and cooperation between Thermoid and distributors.

Lowrey joined Quaker Rubber Co. in 1941 prior to its incorporation into H. K. Porter. He was promoted to Philadelphia district manager in 1950, eastern regional sales manager in 1959, and assistant industrial manager last year.

Edgar M. Corson assumes title

. . . of director of sales for the Data Reduction Division of Fischer & Porter Co., with headquarters at F&P's Warminster, Pa., plant. Prior to this appointment, Corson acted as a national manufacturing representative for the company in the field of traffic count instrumentation. He was also sales manager of engineered products of International Resistance Co. and industrial sales representative for Brown Instrument Division of Minneapolis-Honeywell.

Pittsburgh-Des Moines Steel appoints W. F. Hoffman

. . . as manager of industrial sales, in which capacity he will coordinate and direct all company sales efforts in relation to the petroleum, petrochemical, and chemical industries. With offices at the company's headquarters in Pittsburgh, his responsibilities will cover all sales areas throughout the United States. Hoffman joined Pittsburgh-Des Moines Steel Co. in 1948. For the past 4 years he has been manager of the Dallas district sales office and has devoted most of his time to the petroleum and related industries.

E. J. Bradshaw becomes branch manager at Corpus Christi

E. J. Bradshaw

. . . for Houston Engine & Pump Co., it was announced by Thomas N. Hunt, president of Hunt Tool Co. In addition to expanding the market for new equipment, Bradshaw will also carry out plans to expand service facilities of Hepco at Corpus Christi. Plans call for new facilities for fabricating and installing new equipment such as generator units, compounds, and compressors, as well as for repairing and testing engines. For 3½ years prior to his branch manager appointment, Bradshaw served as a sales engineer for Hepco.

William E. Van Horn appointed Hydraulic Division sales mgr.

. . . of Gar Wood Industries, Inc., at Wayne, Mich. He takes to his new job over 15 years experience in sales and engineering of hydraulic parts and components. Van Horn will head the newly created division which will manufacture and market to original equipment manufacturers a complete line of hydraulic pumps, valves, and other components.

Crane to build plant in Australia

. . . according to T. M. Evans, chairman of the company. Establishment of a manufacturing subsidiary in Australia followed negotiations with the Australian Commonwealth Government for a 21-acre tract of land located in St. Marys, an industrial area near Sydney, New South Wales. Evans said that construction will begin immediately on a factory to produce valves, water meters, and pumps.

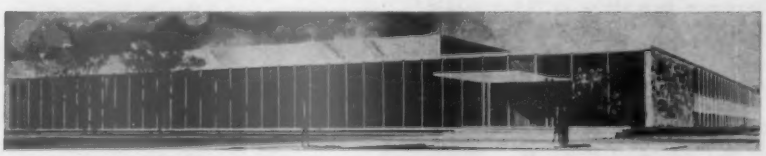
The subsidiary will be known as Crane Australia and will be closely associated with Crane, Ltd., London, England. Geoffrey C. Remington has been named chairman of Crane Australia. He is also chairman of Rolls-Royce of Australia.

In addition to 27 plants in the United States, Crane now has 11 manufacturing plants in Canada, one in Mexico, four in England, two in France, three in Holland, and one in Italy.

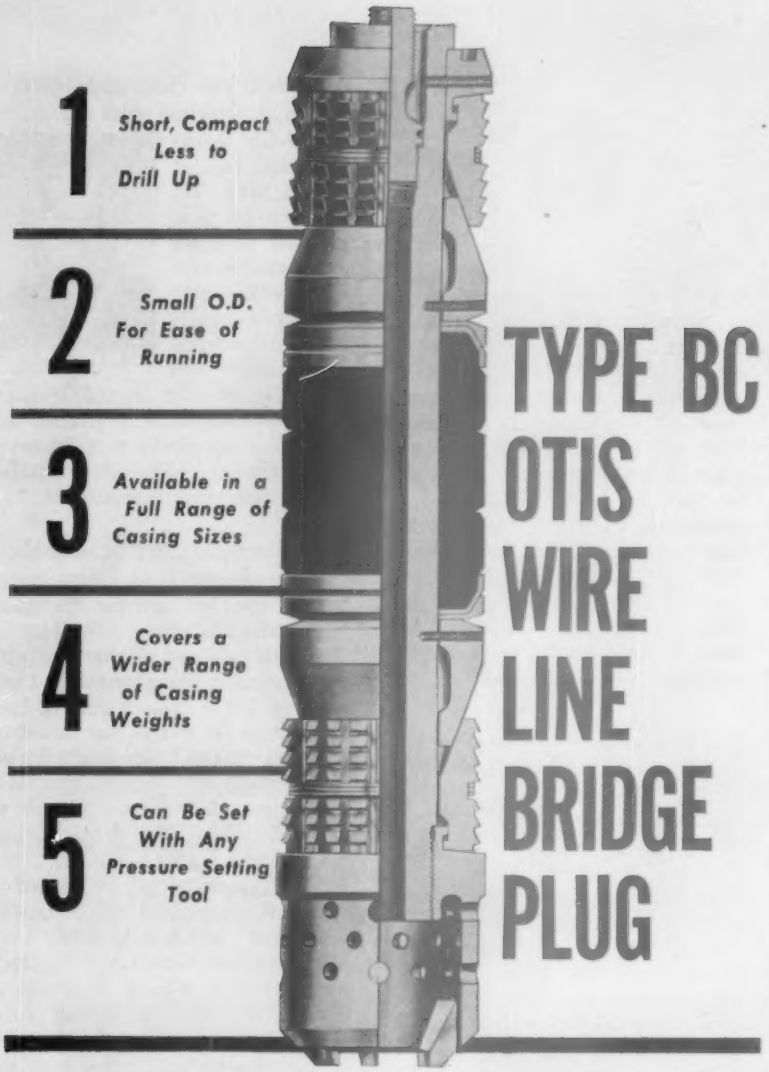
Lunkenheimer Co. names two

. . . sales representatives in the persons of Richard B. Sines and Joe Kaye, it was announced by Melvin W. Pauly, vice president of sales for the Cincinnati firm. Sines was named representative in West Virginia, southern Ohio, and eastern Kentucky, working out of Charleston; Kaye, locating in Houston, will cover Houston, Southeast Texas, and southwestern Louisiana.

Sines was formerly contract manager, acoustical department, for Asbestos & Insulating Co. Kaye, a sales engineer with Walworth Co. before going to Lunkenheimer, has



ULTRAMODERN RESEARCH CENTER in Barrington, Ill., is being planned by Kendall Co., Chicago Division, manufacturer of Polyken industrial tapes and protective coatings. Located on 14 acres of wooded land, the laboratories will occupy about 40,000 sq. ft. and cost is estimated at $1,500,000. The expected completion date is the fall of 1962. About 65 research people will be on the staff. Because of the broad range of products, personnel will include chemists, engineers, physicists, bacteriologists, and other scientific technicians. Research emphasis will be placed on industrial adhesives and plastics.



Every time you specify the Type BC Otis Wire Line Bridge Plug, you get *5 plus features* designed to help you take the guesswork out of your plugging operations — and yet the plug costs you no more than an ordinary plug. For this reason, many operators have standardized on the Type BC. They found they could successfully run the Type BC where other plugs failed to get down. In addition to the 5 big advantages you get with a Type BC Bridge Plug, you will find it's available from leading electric line service companies and stocked in over 200 different field locations. Take the guesswork out of your plugging operations — the next time you need a bridge plug, specify Otis. © 1961 O.E.C.

Type BC Otis Wire Line Bridge Plugs are available in these sizes:

SIZES	CASING WEIGHTS	SIZES	CASING WEIGHTS
2⅞"	6.4 — 8.6 lb.	5½"	13 — 20 lb.
4½"	11.6 — 15.1 lb.	6⅝"	17 — 24 lb.
4½"	9.5 lb.	7"	20 — 38 lb.
5"	18.0 lb.	9⅝"	43.5 — 53.5 lb.

OTIS ENGINEERING CORPORATION
General Offices: 6612 Denton Drive • Dallas
Branches Throughout The Oil Country

over 20 years experience in the Gulf Coast area in the petroleum and petrochemical industries.

Donald W. Waack is appointed manager of sales promotion

D. W. Waack

. . . at Bucyrus-Erie Co., South Milwaukee, Wis. He had been assistant sales-development manager for Schield Bantam Co., Waverly, Iowa, firm with which he served 8 years. In his new position Waack will be in charge of Bucyrus-Erie advertising, publicity, sales literature, photography, publications, and sales aids. He will report to Frank T. House, sales services manager.

W. F. (Bill) Krause, Jr. named

. . . as sales engineer by McMurry Tool Specialties, Inc., Houston. In addition to sales, his duties will be in establishing new sales areas as part of the company's expansion. Formerly associated with another gas-lift manufacturer, Krause has more than 12 years experience in the oil industry.

Wright Surveys, Inc. assigns

W. B. Johnson

. . . Wallace B. Johnson as sales manager, according to M. C. Young, vice president and general manager of the Odessa, Tex., firm. For 10 years Johnson was district production engineer for Atlantic Refining Co., in Odessa.

Mavor-Kelly moves warehouse

. . . facilities from Gretna, La., to 428 Julia St. in New Orleans. The new Bienville warehouse will stock and service the Koppers line of Bitumastic coatings, Carey, and Tapecoat. Mavor-Kelly Co. has its general offices in the M & M Building, Houston, and is the Texas-Louisiana

distributor for Koppers Bitumastic, Philip Carey Mfg. Co., and Tapecoat Co.

Farris Engineering appoints

G. F. Bright

. . . G. Frank Bright as southwestern regional manager, according to Victor W. Farris, president of the Palisades Park, N. J., corporation which makes safety-relief valves, steam traps, plastic pipe take-off machines, fuel economizers, and valve testing equipment. Bright will headquarter in Houston.

Bright left Manning, Maxwell & Moore, Inc., after 10 years of service as product and marketing manager, Consolidated Valve Division, to accept his present assignment with Farris. As regional manager, he will assist customers with problems related to the selection, sizing, application, and installation of safety-relief valves.

Harold Nutt elected chairman

. . . and chief executive officer of Borg & Beck Division of Borg-Warner Corp., announces Robert S. Ingersoll, Borg-Warner president. The division makes torque converters and clutches for tractors and trucks. Nutt, a veteran automotive executive and president and general manager of Borg & Beck since 1955, announced that he will be succeeded in that position by James F. Beré.

Harold Nutt

J. F. Beré

Nutt joined the division in 1930 as director of engineering. He was elected vice president in charge of engineering in 1946, advanced to vice president and general manager in 1954, and was promoted to president and general manager in 1955. Beré goes to Borg-Warner from Axelson Mfg., where he was president and general manager the past 5 years.

PROTECT THE THREADS..

PROLONG THE LIFE

OF DRILL COLLARS AND TOOL JOINTS WITH A WECO COMPOUND

WECO NO-GALL
is a 50% pure metallic zinc base compound.

WECO LO-TORK
is a 50% metallic lead base compound.

WECO's two great compounds are the finest you can use on drill collar and tool joint threads. They provide the bare minimum of thread-ruining friction . . . the utmost in gall resistance. They spread easily and quickly . . . will not squeeze out under high pressure or temperature . . . will not freeze the joint.

For longer life, trouble-free service, easier make-up and break-out of drill collars and tool joints, specify WECO No-Gall or Lo-Tork compound. They are stocked by Supply Stores everywhere.

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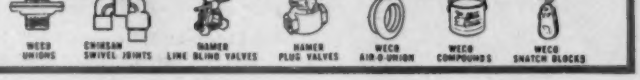

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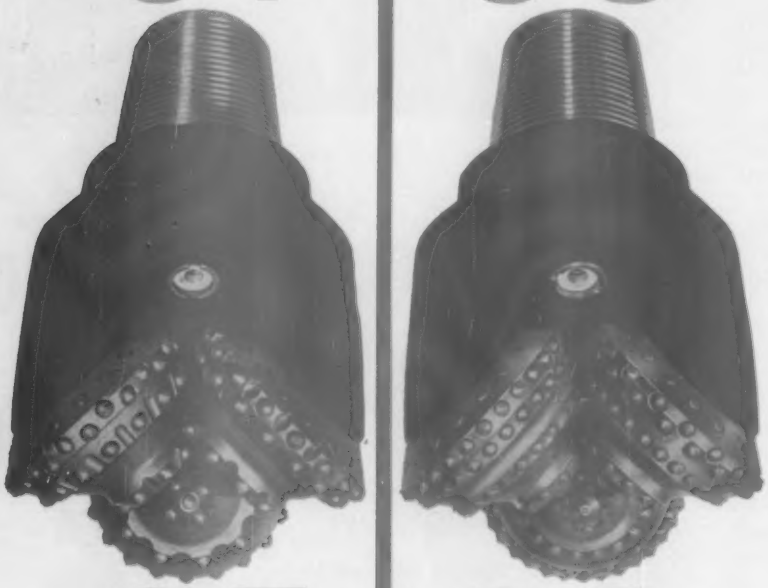

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SETTING NEW RECORDS

in drilling hard abrasive formations

- Conical shaped tungsten carbide inserts insure FASTER PENETRATION
- Flush tungsten carbide inserts insiure FULL GAGE HOLE
- Threaded flow nozzles for easy installation
- Available for both fluid and air carculation

Smith TOOL CO.

A Division of SMITH INDUSTRIES International, Inc.

COMPTON, CALIFORNIA

Branches in Principal Oil Centers Throughout the World

1936 OUR 25th YEAR 1961

THESE BINS, developed by Milwhite, will store 75 tons of mud. Each has a capacity of 75,000 lb. The firm, by use of Taylor instruments, has devised a method of keeping a complete check on how much mud was used when. Patents are pending. Operation is Superior Oil Co. 1 Williams, a wildcat in Assumption Parish, South Louisiana.

Mud-storage bins measure and record amount of mud used

HOW MUCH MUD has been used during any period of drilling is permanently recorded by use of a spring and weight-sensitive indicator. Bill Gros, foreman for Milwhite Mud Sales Co., Berwick, La., points to the section in the mud-bin leg which has been cut to accommodate the indicator. Permanent record tells time, date, and amount of bulk mud withdrawn from storage giving an accurate account of mud used.

North Louisiana is active spot

WHILE the Caddo-Pine Island area continues active north of Shreveport after more than 55 years, another attractive area is drawing a great deal of attention. Locale of the new play is Pendleton-Many area of Sabine Parish, about 65 miles south of Shreveport.

Recently, about a dozen completions a week have been reported and there's no sign of any letup in sight. These wells are not deep and depths of targets vary between 2,800 and 3,300 ft. Pay is Upper Cretaceous-Sara, just above the base of the anhydrite.

The wells are good, too. Most of them are flowing and initial production varies from 56 to 208 BOPD of 41°-43° oil. Presently, Pendleton, in townships 6 and 7n and ranges 12 and 13w, is about a mile west of Many field. It is quite likely that the two fields will be joined as development continues.

Although North Louisiana is considered the domain of the independents, Shell Oil Co. is active in this area. Other operators include: Palm Petroleum Corp., Roland S. Bond, Barnhill-Jackson, and Berwick Mud Co.

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TUBING TONGS
Write For Free Catalog And Price List
Diamond tooth dies make full contact with pipe. Will not crush or score tubing. Extra light, easy to handle. Three Models—K-20 for 1¼" through 2½", K-25 for 1.9" through 3", K-30 for 2⅜" through 4⅛" pipe. *Available Through Your Preferred Supply Store*
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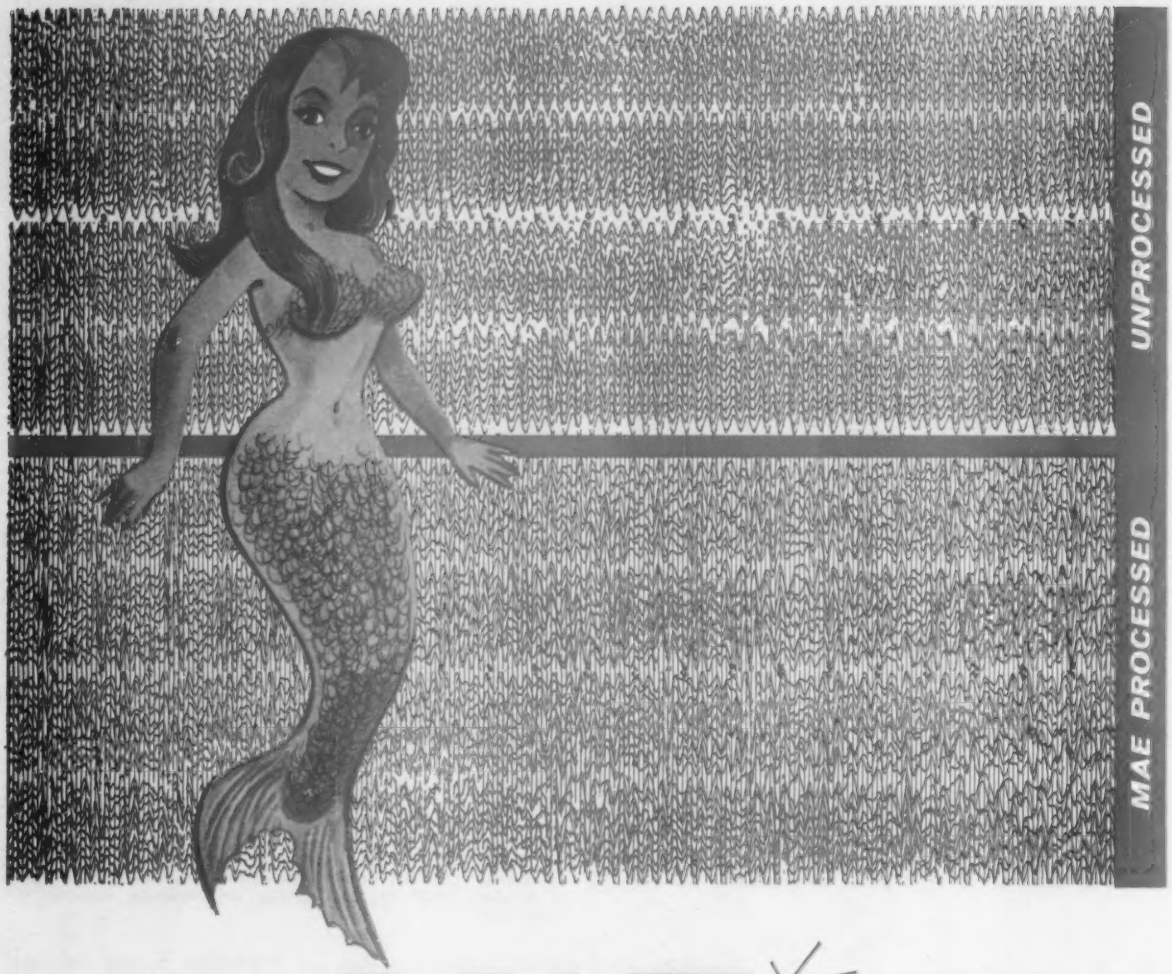


what can MAE* mean to you

Who said mermaids were mythical? MAE is a mermaid, but marine seismic explorationists know she's anything but a legend!

In areas where water reverberations mask reflections from depth, MAE (GSI's Multiple Analyzer Eliminator) is not only a fact, but a definite factor in providing workable seismic data. GSI . . . *and only GSI* offers the advantages of MAE, and MAE-processing can only be accomplished if the special recording techniques used on GSI vessels in both hemispheres are used in the original data gathering.

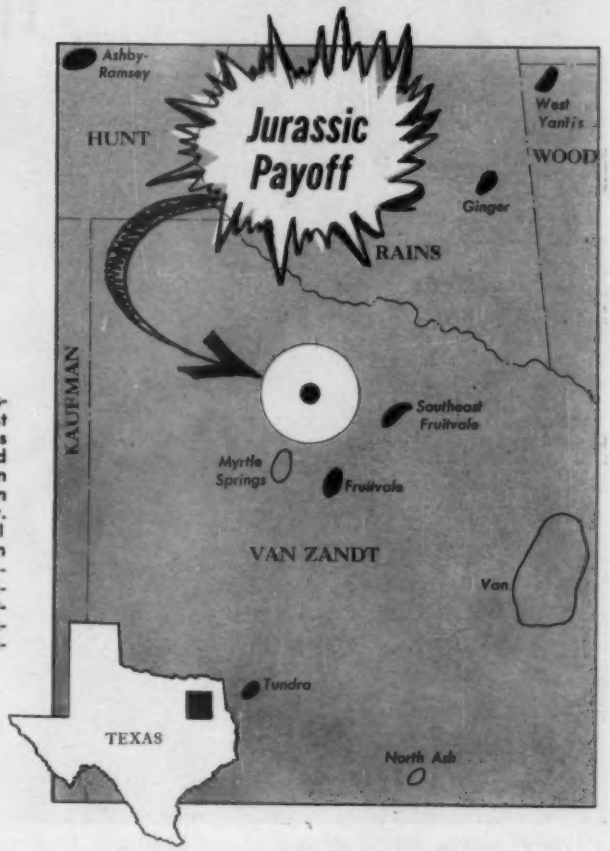
Make a date to meet MAE . . . she'll make your marine operations run smoother.

*MAE IS A GSI SERVICE MARK

GEOPHYSICAL SERVICE INC.
900 EXCHANGE BANK BLDG • DALLAS 35, TEXAS
A TEXAS INSTRUMENTS COMPANY

East Texas play enlivened by three strikes and a book

BY FRANK J. GARDNER



FIRST NEW Jurassic field for East Texas in 1961 has been uncovered at Edgewood, in northern Van Zandt County. Pan American 1 Parker is now in production-testing stage after indicating commercial gas in Smackover at 12,846-12,921 ft.

EAST TEXAS' booming Jurassic play was punctuated by four important events recently. In quick succession came a new field discovery in Van Zandt County, a new pay discovery in Hopkins County, an "extension" in Rains County, and a new book summarizing the entire Jurassic history of East Texas.

The new field was opened by Pan American Petroleum Corp.'s 1 J. H. Parker, a mile southeast of Edgewood, Tex., and 5 miles west and northwest of Fruitvale and Southeast Fruitvale fields, both Jurassic finds. Pan Am took this hole to 13,704 ft. First indication of success came from cores taken at 12,884-12,911 ft. and 12,921-32 ft.; these were mostly dolomitic limestone, bleeding gas and bearing strong sulfur odors. Drill-stem test in Smackover at 12,846-12,921 ft. flowed 1,400 M.c.f. gas daily to indicate that a commercial well may be in the making.

The new pay was found in Como field, southern Hopkins County. Here, Delta Drilling Co. 5 Coker found Smackover gas in more than 200 ft. of pay between 12,429 and 12,947 ft. A drill-stem test at 12,436-12,561 ft. flowed gas at an unreported rate, but in sufficient quantity to rate commercial status. Previous production at Como has come from sub-Clarksville (Upper Cretaceous) sands at 4,000 ft.

The "extension" came at West Yantis field. The field itself lies in the northwest corner of Wood County, but the new discovery is in the northeast corner of Rains County, and is 3 miles southwest of the field limits. In our books, this would rate new-field wildcat rank, but Humble Oil & Refining Co. calls it an extension to West Yantis. The strike, 1 Beall, was finished for 46,500 M.c.f. gas per day (open flow) from Smackover at 12,588-12,618 ft.

The campaign in print . . . These were the first Jurassic events of any importance in 1961, and as if to underscore them, the new book appeared almost simultaneously. "East Texas Jurassic Exploration," published by Rinehart Oil News Co., of Dallas, is an exhaustive report on every angle of the Jurassic search for oil and gas in the East Texas district. Compiled and edited by R. P. Brooks, Jr., the book marks a new departure for Rinehart's familiar area references, in that it appears in loose-leaf format. Index tabs divide the book into five sections, ranging through Geological Notes, Field Data, Production, Jurassic Failures, and Electrical Logs.

The opening pages of the book are devoted to geologic discussion of Jurassic possibilities, and on one of them we find this prophetic paragraph: "The high rate of current drilling activity attests to the fact that there are many untested prospects. One of the most obvious current prospects is the Como field, Hopkins County. There is proven closure in the shallow beds, and it appears certain there will be closure on the Smackover. A deep test is currently drilling on the structure."

Detailed field summaries and maps of every Jurassic field so far found make up the bulk of the new publication. The section on Production presents excellent tabulations on allowables, outlets, and output figures, plus a listing of all producing wells in each field.

The most impressive, and perhaps the most important pages in the Rinehart book are filled with drilling histories of every East Texas well known to have penetrated the Jurassic section. And the closing section carries prints of all available electric logs on these wells.

Closes a busy month . . . In all, August was an important month for the East Texas Jurassic campaign. The new field, the new pay, the extension, and the book . . . all should provide new stimulus to the play.

The big push is on for

A TYPICAL NORTH AFRICA SETTING is sand—and miles of it. This desert seismic crew is exploring for likely drill sites. Photo courtesy of Pan American Petroleum Corp.

Not only has the Dark Continent made new marks in production effort, but exploration is up as new regions get first tests.

NEW OIL-INDUSTRY RECORDS were set in every department last year in Africa. Crude-oil production hit an all-time high of 99,672,705 bbl., an increase of 139% over 1959. This huge increase in oil output was due to the Sahara where operators produced seven times as much oil as in the previous year.

Production totals in Africa ran in order: Algeria, Egypt, Nigeria, Gabon, Morocco, Angola, Congo Republic, and Senegal. The latter countries entered the producing column for the first time.

Exploratory and development activity were both up to new highs. There were 227 wildcats completed in Africa, 25% of them successfully. Libya had 22 new discoveries, Algeria, 17, Nigeria 12, Gabon 4, and Egypt 1. There were 260 field wells completed on the continent, 83% of them successfully. Total footage was 3,624,272 ft., up 22% over 1959. There were 116 active operations at the end of the year.

Sahara. Development drilling at Hassi Messaoud field continued briskly. Production averaged 144,000 bbl. per day. A pipeline from Edjeleh and Zarzaitine fields to the Tunisian coast was opened in September, putting these fields on pro-

Petroleum highlights in Africa 1960

- Crude-oil production rose from 41 million to 99 million barrels.
- Sahara's output was up sevenfold.
- Congo Republic and Senegal entered producing column.
- New record set in wildcatting at 227 wells.
- New record set for field-development wells at 260.
- New footage record set at 3,600,000 ft. plus.
- New record set for drilling rigs in operation at 116.
- New record set for party-months of seismic work at 1,155.
- Wildcats drilled in 17 countries. First drilling in Gambia, Portuguese Guinea, and the Spanish Sahara.

EL AAIUN is a settlement of adobe dwellings in East Central Algeria. It's a jumping-off place into the interior and exists primarily as a resting place for camel caravans. Photo courtesy of Pan American Petroleum Corp.

African oil

duction at a daily rate of 170,000 bbl.

The important new discoveries in the Sahara were El Agreb, Ohanet, Zenani, Timellaline, and Tan Emellel. The big strike of the year for the Fort Polignac basin was made by CEP at Ohanet on the northern part of the Tinrhert Plateau. Pay is the Lower Devonian sandstone. Five wells were drilled during the year, averaging about 600 bbl. daily. There were discoveries in the western part of the basin at Oued Zenani and Timellaline, made by CREPS. These also were Lower Devonian oil wells. On the border of Libya, AUREFREP found some oil at Tan Emellel in the Lower Devonian and in the Ordovician. CREPS found Ordovician oil at Edjeleh, a Carboniferous and Devonian producer.

In the Northeast Triassic basin, exploration continued on the Hassi Messaoud trend and adjacent structures. Cambrian production was found at 10,499 ft. at El Agreb where four wells were brought in. COPEFA found wet gas at Hassi Touareg, 37 miles southeast of El Gassi. Pay is in Lower Triassic and Ordovician sandstones.

Libya. Most exploration in this country was centered in the east-central area south of the Gulf of Sirte. Another active area was in the northern and northwestern part.

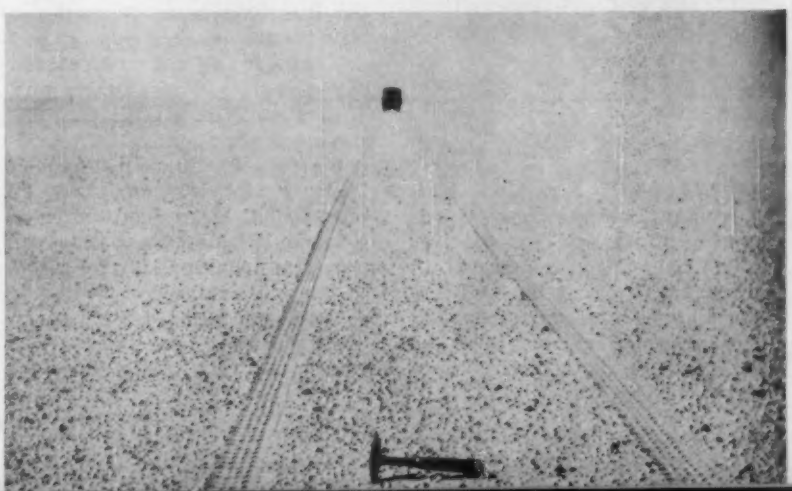
There were five one-well field discoveries in Libya. Three of these were drilled by Gulf Oil Corp. in the center of Concession 66. A fourth single well field was opened by Oasis about 45 miles south of Zelten field and the fifth one-well field was opened by Oasis in Concession 26. Mobil finished four wells in the Hofra area of Concession 11, south of Dahra field, a 1959 Oasis discovery. Oasis completed three tests in the B-59 area 60 miles south of Zelten field.

Data from AAPG Bulletin, July 1961.

SURVEYING for a seismic refraction crew in Senegal is done by this British Petroleum Co., Ltd., crew. The locale is the Koalack District, about 100 miles southeast of Daker. Photo by BP Petroleum Co.

Africa completions 1960

	Development				Wildcat				Total footage	Active rigs, 1-1-61
	Total	Oil	Gas	Dry	Total	Oil	Gas	Dry		
Algeria-Sahara	136	116	5	15	48	8	9	31	1,474,747	40
Angola	4	1	0	3	11	0	0	11	151,308	5
Congo	1	1	0	0	6	0	0	6	41,162	1
Egypt	44	40	0	4	6	1	0	5	283,818	16
Gabon	28	17	0	11	7	4	0	3	189,081	2
Libya	33	26	1	6	98	22	0	76	923,604	33
Morocco	4	2	0	2	4	0	0	4	52,810	5
Nigeria	8	5	1	2	25	12	0	13	328,652	6
Senegal	2	0	2	0	5	0	0	5	67,706	3
Others	..	..	..	..	17	0	0	17	111,384	5
Total	**260**	**208**	**9**	**43**	**227**	**47**	**9**	**171**	**3,624,272**	**116**



GEOLOGIST'S TRACKS on the sands of North Africa depict a new driving force in little-explored areas. Natives are becoming accustomed to roving vehicles and the oil hunter and his pick-axe. Photo by Pan American Petroleum Corp.

OIL PRODUCTION of the new Evalyn field, in Kansas' Seward County, is confirmed and a prolific new gas sand opened by this dually completed well shown during testing operations.

Kansas completion has double value

A DUAL-ZONE WELL completed by Anadarko Production Co. in Seward County of southwestern Kansas not only confirms the Mississippian oil production opened by the discovery last February of Evalyn field, but also uncovers a prolific new gas sand in the overlying Pennsylvanian-Morrow formation.

The new well, 1-A Santa Fe Land Improvement Co., flowed naturally at the rate of 480 bbl. of oil and 1,634 M.c.f.d. of gas while confirming the Chester (Mississippian) oil pay of the discovery well. This zone is perforated at 5,976-80 ft. and 5,983-86 ft.

From the new Morrow zone, perforated at 5,548-56 ft., the well flowed naturally at the rate of 26 M.M.c.f.d. of gas in an open-flow test. Flowing pressure through the 5½-in. casing registered 1,380 psi. during a test producing 8,164 M.c.f.d. of gas. Shut-in pressure is 1,545 psi.

Discovery well, 1-A Browne, also is dually completed with both oil and gas production, but both zones are in the Chester section.

Location is 12 miles north of Liberal within the confines of the Hugoton Permian gas-producing area.

Deepest San Juan test abandoned as dry hole

The deepest test yet drilled in the San Juan basin of northwest New Mexico has been given up as a dry hole. It also is the deepest test anywhere in the Four Corners area.

El Paso Natural Gas Co. discontinued operations in the record-depth test, its 50 San Juan unit 29-5, at total depth of 14,436 ft. after drilling more than 300 ft. of quartzite. Precambrian rock was topped at 14,030 ft.

The test is a wildcat in Section 7-29n-5w, in Rio Arriba County. The only significant shows it had were in a couple of drill-stem tests in the Pennsylvanian section, logged at 12,070 ft. from a surface elevation of 6,492 ft.

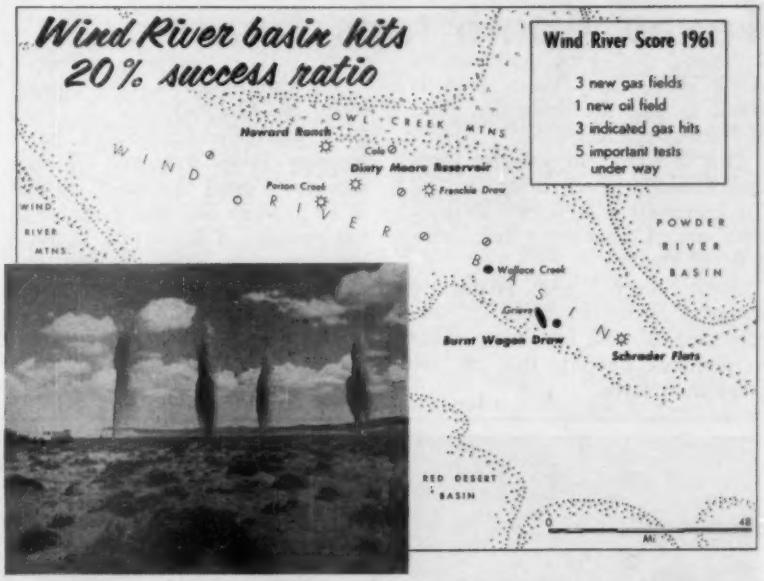
First test was at 12,668-12,703 ft. and open 2 hours. It had gas at the surface in 40 minutes but volume was too small to measure. The test was rerun at 12,660-12,705 ft. with tester open 3 hours. Gas was at the surface in 80 minutes. Flow initially was at the rate of 260 M.c.f.d. but declined to 150 M.c.f.d. within 10 minutes.

Previous deepest test in northwestern New Mexico reached a depth of 13,590 ft. It was drilled by Magnolia Petroleum Co. (now Socony Mobil) in 18-23n-2w, Rio Arriba County, in 1955.

EXPLORATION OUTLOOK

Wyoming wildcatting pays off

A SPIRITED WILDCAT SPREE in Wyoming's Wind River basin, one of the most complex and hard-to-hit basins in the Rockies, is paying off with a 20% success ratio this year. Since January 1, Wyoming operators have tapped three new gas fields, one new oil pool, have three gas discoveries near completion stage, and are working hard at five important wildcats in Wind River basin country. This year's healthy score compares to only 5 discoveries out of 40 attempts in 1960.



TWO NEW FIELDS 25 miles apart in Wyoming's Wind River basin were officially opened last week at Frenchie Draw and Poison Creek, lending impetus to a growing exploratory surge in this region. (See p. 223, OGJ, September 4, 1961.)

The complex northern side

. . . of Wind River basin continues to take the brunt of exploratory drilling. Two of the year's completed gas discoveries are located here; all three of the indicated discoveries are in this area; and three of the five important wildcats are drilling here.

This northern portion of the most hemmed-in basin in Wyoming has been the scene of brisk Tertiary and Upper Cretaceous wildcatting and development for the past few years. A succession of important finds began with the Lysite and Lost Cabin discoveries — Badwater, Rockies' deepest producing area, Waltman unit, Cooper Reservoir. This year's finds are located at Howard Ranch, Dinty Moore Reservoir, Poison Creek, Frenchie Draw, and Cole. Shell Oil Co. et al. 1 Government, C NE SW 3-37n-92w, Fremont County, opened Dinty Moore Reservoir field, flowing 2,591 M.c.f.d. from basal Fort Union Tertiary sand. Total depth was 10,000 ft. Shell also opened Howard Ranch field at its 23-15 unit in NE SW 15-39n-93w, Fremont County. This one flowed 2,163 M.c.f.d. from Lance Upper Cretaceous, a comparatively new pay for Wyoming. Total depth of this new wildcat was 11,474 ft.

Tests are still going on at the three indicated gas discoveries. Humble Oil & Refining Co. 1 Frenchie Draw unit, C NE NE 21-37n-89w, flowed more than 5 M.M.c.f.d. from an unidentified pay below 9,500 ft. Objective here is Lance at 10,000 ft. This well is south and southwest of the Lysite area. Humble's Poison Creek unit discovery prospect, located in C NE NE 32-37n-93w, flowed more than 2,500 M.c.f.d. from perforations at 5,000 to 5,500 ft. Pay here is reportedly Fort Union Tertiary. The same company has tested gas shows at a second wildcat on this unit in NE NE 17-37n-93w. Humble is also working at a second test on the Frenchie Draw unit in C NE NE 21-37n-90w.

McCulloch Oil of California 1 Government-Cole, NW NW 31-39n-90w, Fremont County, is shut in after testing between 5,992-96 and 5,953-58 ft. The best gas recovery was 1 M.M.c.f.d. from perforations at 5,992-94 ft.

Important wildcats in the works on this side of the basin include: Phillips Petroleum Co. 1 Missouri, wildcat, NW SE 8-2n-4e, Fremont County. This is drilling toward 8,000 ft. and Fort Union; El Paso Natural Gas Co. 1 Hornbeck-Government, Fremont, NE SW 19-4n-3e, going to 11,500 ft. or Mesaverde Cretaceous. Wildcats in the central part of the basin include: El Paso Tepee Rings, a Mesaverde try in NE SW 7-35n-89w, Natrona, and Shell 11-22 Aspirin Creek, NW NW 22-35n-87w, Natrona County.

The southeastern part of Wind River

. . . has two new discoveries; oil at Burnt Wagon Draw, gas at Schrader Flats. Emmett Schick opened Burnt Wagon Draw field in Natrona County, NW SW NW 32-32n-8w, with oil production. Furguson & Bosworth 1 Batzer-Government flowed 6,250 M.c.f.d. from Muddy sand of Cretaceous age.

Location is in NW SW 26-31n-82w, Natrona County. Other activity in this part of the basin includes National Cooperative Refinery Association's third well at Wallace Creek, northwest of Grieve field in Natrona County. The Wallace Creek discovery was last year's exploratory highlight in the basin. The discovery well flowed 1,416 bbl. per day on drill-stem test of the Muddy zone of Thermopolis shale (Upper Cretaceous) at 10,333-74 ft.

Grieve also produces from Muddy. This Wallace Creek find shifted Wind River's drilling gravity to the southeast for awhile, but indications are that the central and northern reaches will continue to grab the news.

—John C. McCaslin

Texas' Como taps Jurassic

ANOTHER East Texas field is about to join the mounting ranks of Jurassic producers.

It is at Como, in southern Hopkins County, where Delta Drilling Co. tested gas in an open-hole drill-stem test of Smackover lime in its 5 W. H. Coker.

Since then 5½-in. production string of casing has been run, and preparations now are being made to perforate opposite this pay for production tests.

The drill-stem test was of an interval at 12,436-12,561 ft. using ¼-in. chokes and a 6,500-ft. water cushion. Tester was open 29 minutes and flowed the water cushion in 19 minutes, followed by gas with top pressure of 2,000 psi. Bottom-hole pressure while flowing was 4,840-4,925 psi. Shut-in pressure after 30 minutes was 6,198 psi.

Hole was deepened to 12,947 ft. before casing was run. More than 200 ft. of Smackover pay was indicated. Top of the Smackover was logged at 12,429 ft. from elevation of 457 ft.

The Como discovery is 8 miles northeast of rich Smackover gas-condensate production opened last year at West Yantis, in northwestern Wood County, by Pan American Petroleum Corp. Previous production at Como has been from the sub-Clarksville horizon.

A 3-mile southwestward extension of the Smackover production at West Yantis into northeastern Rains County has been made by Humble Oil & Refining Co.

Humble's extension well, 1 Louise Beall-West Yantis Gas unit, is rated at 46,500 M.c.f.d. of gas with a gas-condensate ratio of 843 M.c.f. per barrel. Its Smackover pay, given a 5,000-gal. acid treatment, is perforated at 12,588-12,618 ft.

The Como discovery follows closely another new Smackover discovery by Pan American in the Edgewood area, 20 miles farther southwest in northern Van Zandt County.

There, Pan American's 1 J. H. Parker is starting production tests of gas and condensate showings obtained in open-hole drill-stem tests of Smackover pays at 12,846-12,921 ft. and 12,942-13,001 ft.

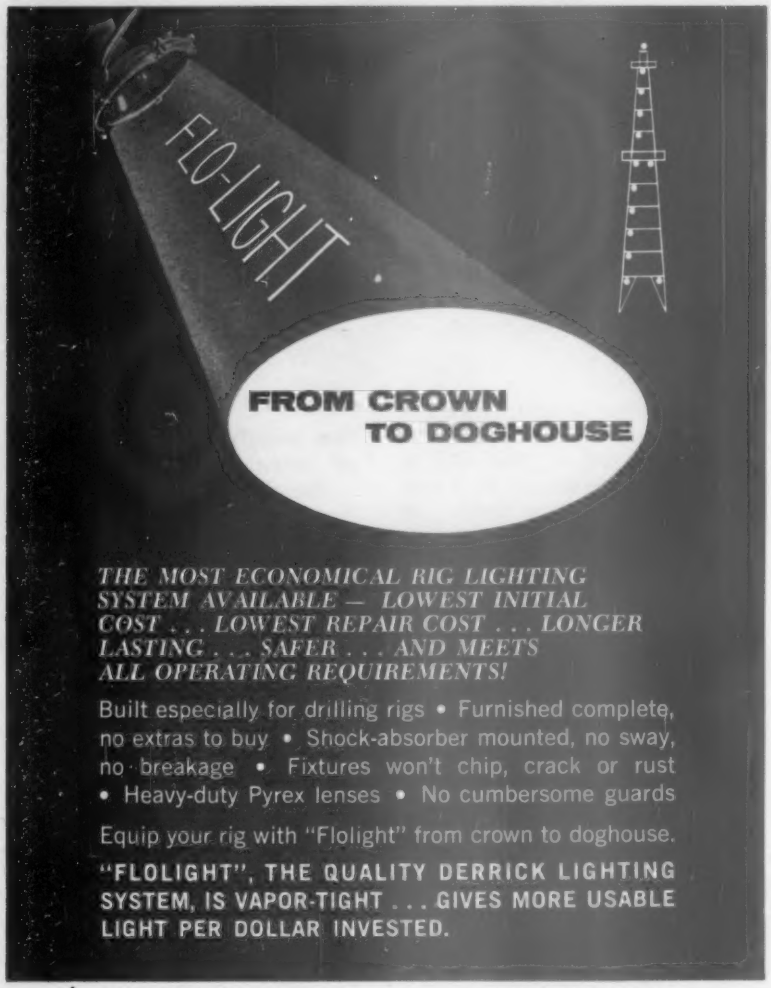
Wyoming's Sweetwater test finds Fox Hills pay

A new pay has been encountered in the Wamsutter arch portion of Green River basin. At Texas National Petroleum Co. 1-8 Federal, C NE NW 8-19n-98w, Sweetwater County, Wyoming, the Fox Hills sand yielded 8 M.M.c.f. of gas daily from perforations at 3,739-45 ft. after acid treatment.

Fox Hill is part of the Montana group of Upper Cretaceous. Although this formation is sometimes picked as a stratigraphic top, it is not common nomenclature in the area. This is the first production from this formation in Green River basin.

The discovery lies between Pattrick Draw and Arch unit production about a mile from each producing area. Top of Fox Hills was picked at 3,735 ft. and flow was tested through 2-in. tubing. Tubing pressure was 200 psi. and casing pressure was 800 psi.

The test was drilled through the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Almond, part of the Mesaverde section, with the top of the Almond logged at 5,230 ft. Minor shows encountered in the Almond, which produces both at Patrick Draw and Arch unit, were not considered commercial before the operator tested uphole in Fox Hills.

New Louisiana field opens in Terrebonne

A wildcat 1½ miles south of production at Sweet Lake, in Terrebonne Parish, southeastern Louisiana, is being completed as a new gas discovery. It is Cyprus Oil Co.'s 2 Continental Land & Fur Co., which flowed initially at the rate of 2,500 M.c.f.d of gas through ⅛-in. choke. Pressure registered 4,700 psi. Pay is perforated at 11,991-12,001 ft.

Rich gas find extends South Louisiana field

Rich gas-condensate production has been established in a long stepout well in the North Ossum area of Lafayette Parish, South Louisiana.

The well, drilled by Hudson Oil & Gas Corp., is completed in two zones, one perforated at 12,396-12,432 ft., and the other at 12,655-62 ft. and 12,616-44 ft.

Flow from the lower zone tested 3,100 M.c.f.d. of gas through 12/64-in. choke with a recovery of 155 bbl. of 46.2°-gravity condensate per million cubic feet. Shut-in pressure is 6,295 psi.

The upper zone flowed at the rate of 3,380 M.c.f.d. of gas through 12/64-in. choke with 162 bbl. of condensate per million cubic feet. Shut-in pressure is 6,277 psi.

Location of the well, 1 George Domingue, is a half mile southeast of the nearest well.

Stepout at Keg Coulee tests 20 bbl. per hour

In Musselshell County, Montana, a joint venture swabbed 20 bbl. of oil per day from Tyler "A" sand perforations at 4,367-99 ft. American Metal Climax, Lawrence Barker, Jr., and Continental Oil Co. 32-6 De Jaegher, C SE NW 32-11n-31e, in Keg Coulee field area went to 4.693 ft.

Operator is installing pump to put well on production. Elsewhere in the vicinity, the 32-4 De Jaegher, C NW NW 32-11n-31e is drilling below 2,700 ft. The group had previously completed 32-14 U.S.A., C SE SW 32-11n-31e, which is pumping at rate of 517 bbl. oil and 20 bbl. water daily from an interval in Tyler "A" sand at 4,376 ft.

American Climax Metal et al. have perforated a well to the southwest at 4,654-58 and 4,660-67 ft. in Tyler "B" sand. This well, 5-4 De Jaegher in C NW NW 5-10n-31e, was drilled to 4,785 ft. and is being sand-fractured uphole.

Old Southeast Texas dry hole to deepen to Glen Rose

An old 9,514-ft. dry hole in southern Houston County, in southeastern Texas, has been taken over by Pure Oil Co. for deepening to test the Glen Rose horizon.

The hole, drilled by D. D. Feldman Oil & Gas Co. and Texmo Oil Co., is about 2 miles northeast of the Glen Rose discovery well Pure completed last January in Fort Trinidad field.

That well (12 Bruton) still is the only Glen Rose well at Fort Trini-

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dad, and the farthest coastward Glen Rose production of the East Texas embayment. Its Glen Rose pay is perforated at 10,576-94 ft., and produced initially at the rate of 264 bbl. of 48.5°-gravity oil daily through ¼-in. choke.

Pure proposes to deepen the old hole to 11,500 ft., which should carry it well into, or possibly through the section. The Fort Trinidad well was drilled to 12,810 ft., but was cased only to 11,000 ft.

The Feldman-Texmo hole was abandoned in February 1954 with no shows reported. It topped the Woodbine, last reported marker, at 8,305 ft. from elevation of 229 ft.

Fort Trinidad, an old field, also is productive from the Woodbine and Georgetown.

Queen City pays off in South Texas discovery

A new Queen City discovery has been made by Argo Oil Corp. and Louis H. Haring, Jr., in their joint 1 Welder heirs wildcat 2 miles south of Seven Sisters field, in Duval County, South Texas.

Queen City pay is perforated at 6,130-32 ft. with bottom of the hole at 6,412 ft. The well is rated good for 8,600 M.c.f.d. of gas, calculated open-flow potential.

New Texas coast field opens in Hardin County

Discovery of new Yegua production in Hardin County, upper Texas Gulf Coast region, is reported by F. W. Holbrook.

His discovery well, 2 Kirby Lumber Co., 4 miles west of Village Mills, flowed 153 bbl. of 43.9°-gravity oil daily through 9/64-in. choke. Flowing pressure was 990 psi., and gas-oil ratio 330 cu. ft. per barrel. Yegua pay is perforated at 6,160-63 ft.

Testing now is under way for a dual completion in a lower zone, perforated at 6,409-6,411 ft., and showing gas and condensate production.

Location of the discovery is in the gap between Village Mills and West Village Mills fields, in the north part of the county, just south of the Tyler County line.

Large gas flow extends South Texas Elms field

A long-extension well to Elms field, 10 miles southwest of George West, in South Texas' Live Oak County, has been completed as a prolific gas well.

The well, drilled by M. P. S. Production Co., Harry Hurt, Inc., and North Central Oil Corp., tested for an absolute open-flow potential of 51 M.M.c.f.d. of gas. Its shut-in pressure is 3,841 psi. Gas yields 54.7°-gravity condensate in the ratio of 32,700 cu. ft. per barrel.

Production is from the second Massive Wilcox sand with casing-perforations at 7,916-28 ft.

Location is on the operators' Dougherty estate lease in the C. Tuttle Survey.

California company starts wildcat test in eastern Arizona

A WILDCAT drilling program is planned in the Holbrook basin of eastern Arizona by California Oil Co.

California Oil, a subsidiary of

Standard Oil Co. of California, has staked a location in the center of the NW 12-14n-18e, in Navajo County. Boyle Brothers Drilling Co., Salt Lake City, has the contract and is expected to spud the well any day. The location is 18 miles southwest of Holbrook.

Several shows have been reported in the wells drilled in the basin over the last 15 years, but none has been commercial. California's test, 1 State 25-19, is 2 miles south of two dry holes drilled in 1944 in a joint venture of Union Oil Co. and Continental Oil Co.

Lynn Lockhart, formerly of Texas and now a member of Arizona's Oil and Gas Commission, is also among the operators who have drilled the basin.

The new test is projected to 3,400 ft. At this depth it is expected to test the Naco (lower Pennsylvanian), Red Wall (Mississippian), and Martin (upper Devonian) zones.

California Oil has about 30,000 acres under lease in this part of Arizona. The company has been doing geological work in the area for several years.

Sooner's Blaine void may be filled

IN AN EIGHT-TOWNSHIP void in Central Blaine County, Oklahoma, Texaco Inc. has come up with a significant strike. Northeast of Watonga town site, Texaco 1 C. Swanegan, C SE NE 11-16n-11w, tested three intervals below 9,000 ft. for a flow of 5.4 M.M.c.f. gas and 62 bbl. condensate daily through a 12/64-in. choke.

Section perforated was in zones at 9,030-34 ft., 9,052-64 ft., and 9,071-77 ft. Estimated open flow may run as high as 30 M.M.c.f. daily..

Site of the wildcat strike is truly in the boondocks as far as adjacent production is concerned. The one-well South Watonga field lies 8 miles southwest, and to the northeast 11 miles way is the southernmost well at North Cooper production.

To the east in Oklahoma's Kingfisher County, drilling has been continuing at a fast pace. Not only has production been good, but the success ratios of both wildcat and development wells have been abnormally high compared to the nation's average. Texaco's discovery in Blaine may arouse further interest in this promising, though little-explored, area.

Oil well blows in in S. W. Lacy gas area of Kingfisher County

FLOWING oil production has been discovered in the Southwest Lacey gas area of northwestern Kingfisher County, Oklahoma.

The discovery was by Calvert Exploration Co. in its 1 River unit from the Mississippian - Meramec formation. Gas production in the field is from the higher Manning and Chester zones. The oil discovery offsets a Manning gas well on the east.

The well blew in flowing oil as crews started to drill ahead below a string of 7-in. protection casing that had been set and cemented at 7,895 ft. in the Meramec. Bottom of the

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hole was only 1 ft. below the casing point.

With chokes installed, the flow in five hours was 177 bbl. While on 10/64-in. choke, pressure was 1,250 psi. Through 12/64-in. choke, it was 1,150 psi.

Flow from the open hole increased as drilling proceeded. At 7,973 ft. the flow was at an estimated rate of 48 bbl. an hour.

Since then, the flow has been killed with mud to deepen the hole, projected to 9,200 ft.

Nearest Meramec oil production is in the North Dover district, 10 miles east.

Pine Island seems ageless popular play

IN AN AREA about 30 miles north of Shreveport, independents and a couple of major firms are quietly completing one well after another without fanfare. In Caddo Parish during the past couple of months, wells have been completed at the rate of 15 to 20 a week.

Pine Island is not a new area and if any single factor can be attributed to its present popularity, it's fracture treatment. The wells are not deep nor are they high-rate producers. The beauty of the locale is that more than a half-dozen different pays are found above 3,500 ft. Most of the wells go on pump shortly after completion.

Located on the Sabine uplift in Northwest Louisiana, Pine Island was first drilled in 1906 as the Caddo field. In 1953, Caddo and Pine Island were considered one area. To date, there have been more than 7,000 wells drilled.

The targets sought include: Nacatoch sand 900-1,050 ft.; Annona chalk 1,300-1,700 ft.; Austin chalk 1,000 - 1,100 ft.; Blossom sand 1,800-1,860 ft.; Woodbine sand 2,000-2,100 ft.; Washita-Fredericksburg 2,200-2,300 ft.; Paluxy sand 2,760-2,800 ft.; and Rodessa 2,975-3,025 ft.

Until recently, a dry hole was almost unheard of in the sector. Lately there have been more than usual but the success ratio is high. Except for a few major firms, Texaco Inc. and Pan American, the operators are largely small or independent firms. Some of the companies working in the area include: Abney Oil Co., J. W. Watson, Ross Production Co., C. C. Beasley, A. J. Hill, D. P. Magourick, J. P. Boyter, Snelling Bros., C. L. Morse, M. W. Byerley, W. C. Allen, M. E. McGaugh, Barnwell Drilling Co., Joe M. Burnham, Simon Lebow, Young Co., and John F. Mitchell.

Three wildcats show for field discoveries in Southern Alberta

A GASSER, a well of still unknown quantity, and an apparent oil-discovery well are drawing attention to Alberta's southern plains.

The trio of wells that rewarded their backers with some degree of success extend along a 40 mile trend in a district that has had its share of gassers, as well as oil teasers.

Most northerly of the wells is the indicated gas discovery, Tenneco Oil Co.'s Chestermere Lake wildcat. It is 9 miles southeast of Calgary. The test that appears to be the first commercial oil strike for southern Alberta in many months is the farth-

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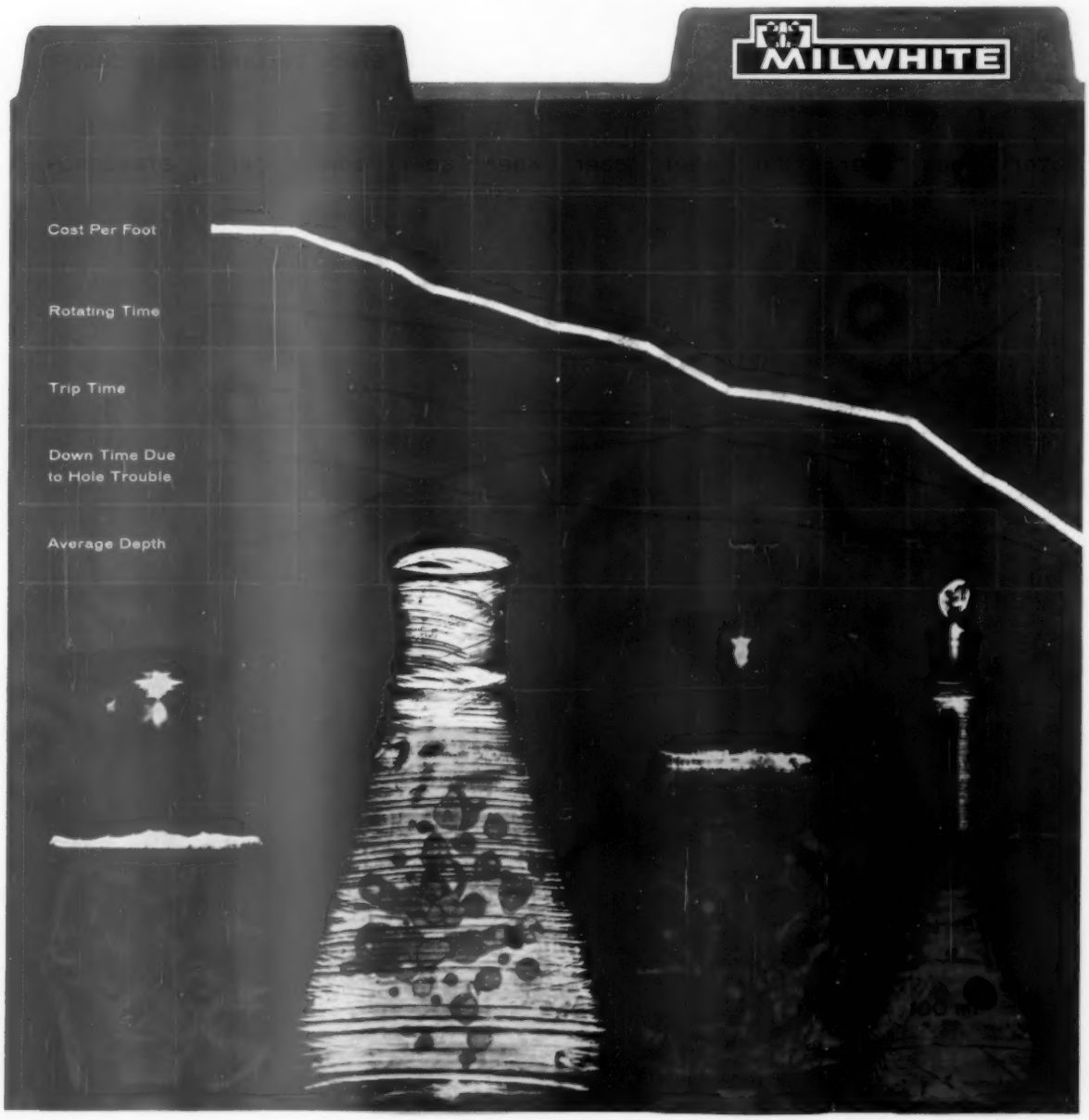

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est south of the three tests. It is in the Parkland district, 50 miles southeast of Calgary. This well was drilled by Canadian Pacific Oil & Gas, Ltd.

Midway between these two ventures and slightly east of the straight line joining the other wells lies the currently testing venture that has hopes of oil production. At best a marginal well is indicated. This test is owned by Richfield Oil Corp. and Medallion Petroleums, Ltd.

The Tenneco well has been tabbed officially as a potential gas producer with production casing set, initial tests completed, and the well shut in awaiting further development and a market. This wildcat, Tenn-A-1 Chestermere, on LSD 10, 27-22-28w4, had 40 ft. of porosity in the basal Blairmore section below 6,720 ft. Total drilled depth was 6,888 ft., which also tested this location for Elkton-Mississippian zone unsuccessfully.

Canadian Pacific Oil & Gas, Ltd.'s Parkland strike, CPOG Parkland, on LSD 11, 28-15-26w4, should result in oil production. On basis of initial tests the Turner Valley section of the Mississippian, which came in about 6,915 ft., oil production with a high gas-oil ratio has been indicated. The operator has been testing further to trim gas recovery. Flow tests produced crude at from 25 to 30 bbl. daily with gas-oil ratio of between 5,500 and 8,400 cu. ft. per barrel.

Richfield Oil's test, Herronton, on LSD 11, 29-19-26w4, must still be labeled with a question mark. Further tests will be required to know if it will be an economic success or one of those geological successes. The well reportedly showed some oil encouragement in both the basal quartz and Mississippian. Attempted straddle-packer tests of the zones failed when operator was unable to seat packer.

New Mississippian pool opened in West Kansas

A wildcat 8 miles southwest of Ness City, in southern Ness County, western Kansas, has swabbed 38°-gravity oil at the rate of 132 bbl. a day.

It opens another Mississippian pool, located a mile southwest of Hair field, nearest production.

Discovery is by Pickrell Drilling Co. at its 1-A McCreight, in 9-20s-24w.

Mississippian pay is the Fort Scott (Cherokee) member, perforated at 4,322-27 ft.

Pumping equipment is being set up.

New Ohio pool extended

Another successful extension to the pool-opener in Smith Township, Mahoning County, Ohio, has been reported by East Ohio Gas Co.

The N. Cook, Section 5, had a natural gage of 230 M.c.f. of gas from Clinton sand at 4,796-4,866 ft. After fracturing, gage was 2,142 M.c.f. with a rock pressure of 1,445 psi.

Activity around the Logan area continues at a brisk pace. In Falls Gore Township, Hocking County, an eastward stepout by Oxford Oil Co. resulted in a dry gasser with a flow of 2,500 M.c.f., 5 days after fracturing. Clinton sand in 2 Henry Howdyshell, Section 30, was logged at 2,846-65 ft. Rock pressure was 980 psi.

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Galvomag, the high-potential magnesium anode developed by The Dow Chemical Company, meets both of these requirements: It delivers 20 to 35 per cent more current than standard H-1 alloy magnesium anodes; and it has a current efficiency (ampere hour rating) comparable to H-1 anodes. Other so-called "high potential" and "high current" anodes tested however, do not show current efficiencies in a comparable range.

To help you get the most for your magnesium anode dollar, we suggest that you specify Galvomag or its equivalent in solution potential and ampere hour rating.

CSI engineers—pioneers in cathodic protection—have also developed a wide variety of special sizes and shapes to make Galvomag even more efficient. For example, the use of these special sizes in "hot spot" protection of pipe lines makes it possible to lower the number of anodes required by one-third—without decreasing the amount of protection or shortening the life of the installation.

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Refiner Facing Busy Schedule

• New manufacturing head for Socal's Western Operations has three plants under him. A fourth is being planned.

NELSON T. BOGART is a prime example of how employing college students during summer vacations can pay off.

Bogart's first brush with Standard Oil Co. of California was as a laborer doing vacation work at the company's El Segundo refinery in Los Angeles. Today, he's vice president and general manager of manufacturing for Standard of Cal's Western Operations, Inc., the operating company on the West Coast.

In addition to the El Segundo plant, Bogart also is responsible for the 210,000-bbl. Richmond refinery near San Francisco, and for the new 35,000-bbl. Hawaiian refinery which went into partial operation earlier this year. And a fourth refinery, a 20,000-bbl. plant in Alaska, will be under his jurisdiction when it goes on stream in mid-1963.

These four plants represent a combined crude capacity of 415,000 bbl. daily.

In addition to being the West Coast's biggest refiner, Standard of California has gained recognition as a leader in several phases of refining operations.

Nelson T. Bogart
. . . heads big refining operation.

The El Segundo cracking plant where Bogart worked during his early days with the company is now the scene of some advanced process control automation. The plant's 40,000-bbl. fluid cat cracker will go on closed loop computer control this month.

The computer work at El Segundo—plus bringing on some downstream processing in Hawaii, building a plant in Alaska, and keeping an eye on Richmond—will mean some busy days for Bogart.

Background . . . Bogart was born and reared in southern California.

The new vice president, a native of San Bernardino, received his bachelor's degree in chemical engineering at the University of Southern California in 1937. Two years later he received his master's in chemical engineering practice from the Massachusetts Institute of Technology.

A year after joining the engineering staff at El Segundo, Bogart was named foreman of the cracking division. He moved 450 miles north to the Richmond plant in 1946 as assistant superintendent of the cracking division, and later was named superintendent of the division.

In 1955 Bogart moved across San Francisco Bay to the company's headquarters as assistant manager of operations planning. Three years later he returned to El Segundo as the refinery's manager of operations.

The management of Western Operations called Bogart back to San Francisco in 1959 as assistant general manager of the manufacturing department. He held this key post until he was named head of the department last month.

▶▶▶ Personals

Harvey F. French, district geologist for Green River Basin Corp., has moved to Green River, Wyo., from Rock Springs, Wyo., as part of the transfer of district operations headquarters.

Lawrence W. Lee, formerly executive vice president and general manager of Canadian Husky Oil, Ltd., has been elected president and chief executive officer of Wainwright Producers & Refiners, Ltd. **Arthur C. Knight,** formerly marketing vice president for Canadian Husky, was named executive vice president in charge of marketing and refining for Wainwright. Wainwright's new board will include **W. G. McMahon,** chairman; Lee; Knight; **Robert S. Rapp; Howard E. Travis;** and **D. B. McDougall.** Rapp is executive vice president, finance, for the company. Travis is vice president in charge of the chemical division, and McDougall is exploration and production vice president.

E. Z. Hannon, staff land man for Sinclair Oil & Gas Co.'s Houston division, has retired after 29 years with the company. Hannon had been division land man and division exploration superintendent for Sinclair before becoming staff land man.

Richard P. Bond, sales manager of Stauffer Chemical Co.'s Consolidated Chemical Industries division, has been promoted to vice president of sales in this division. He will continue to headquarter in Houston.

William D. Morrison has joined Hooker Chemical Corp. as general manager of the company's new international division. He will headquarter in New York.

Robert W. Davis, San Francisco, has been named manager of Salt Lake Refining Co., subsidiary of Standard Oil Co. of California. He succeeds **John R. Grey,** who was recently named vice president of California Oil Co., western division.

Marvin E. Huyser, Montana district marketing manager for Continental Oil Co. in Billings, Mont., has been named Colorado district marketing manager in Denver. He succeeds **Max G. Punches,** who has been promoted to northern division marketing manager for the Rocky Mountain region.

▶▶▶ Personals

John Baird, engineer with Standard Oil Co. (Ohio), has been transferred from the Cleveland refinery-engineering department to the Lima, Ohio, refinery.

William M. House, manager of operations for Signal Oil & Gas Co., has been named head of the production department's California division. He will headquarter in Huntington Beach, Calif. **Harold E. Nissen** has been named superintendent of the Huntington Beach district. He succeeds **R. M. Pyles,** who has retired but will continue as a consultant with Signal in Los Angeles.

Carl D. Hall, assistant general sales manager, merchandising, for Texaco, has been named assistant general sales manager, administration. **Milton C. Lewis** has been transferred from Tulsa to New York to succeed Hall. **George W. Johnson,** assistant division sales manager in Indianapolis, will succeed Lewis as manager of LPG sales with headquarters in Tulsa. **John H. Dea,** New York division sales manager, has been named assistant to the vice president. **Walter J. Williamson,** assistant division sales manager in Norfolk, will succeed Dea in New York. **John T. Hardy,** Dallas assistant division sales manager, has been transferred to New York as manager of sales promotion. He succeeds **Ray Apy,** who has retired after 38 years with the company. **George C. Ash,** assistant Houston division sales manager, will succeed Hardy in Dallas.

Fulton Robinson, director of marketing research and costs at British American Oil Co.'s head office in Toronto, has been named manager of private-brand sales, a new position in B-A's marketing department. Also in the marketing department, **W. S. Whiteford,** Quebec division manager with headquarters in Montreal, has been transferred to Toronto as manager of sales planning. **R. J. Alm** will succeed Whiteford as Quebec manager. **C. G. Walker,** director of retail sales, has been appointed manager of the Alberta marketing division, succeeding Alm. Walker will headquarter in Calgary.

G. T. Thomas, Jackson, Miss., district geologist for Ohio Oil Co., has been appointed senior geologist on the Tulsa staff.

Harry H. Sisson has been named staff geophysicist in Humble's southeastern region office in New Orleans. He was formerly chief geophysicist for Monterey Oil Co. in Los Angeles.

Richard E. Baker, plant foreman of the Wilmington plant in Mobil Oil Co.'s Los Angeles division, has been named production supervisor of the Falfurrias area in the Corpus Christi, Tex., producing district. **Ernest J. (Pete) Dickinson, Jr.,** production foreman in the Lafayette, La., district, has been promoted to production supervisor of the Morgan City, La., area.

W. J. Price, manager of process engneering with C. W. Nofsinger Co., has been elected vice president of production for Western Petrochemical Corp. He will be in charge of manufacturing operations of both the Warwick wax division and the polymer division.

George J. Hanks and **H. William Loveland** have retired as directors of South Penn Oil Co. and **Ralph B. Gilpatrick, Jr.,** vice president of Mellon National Bank & Trust Co., has been elected a director. **Thomas Murray,** a director and member of South Penn's executive committee, will succeed Hanks as chairman of the executive committee. **R. W. Grunert,** senior vice president and a director, has been appointed to the executive committee, replacing Loveland. Hanks was a vice president of Tidewater Oil Co. before joining South Penn in 1944 as executive vice president. He later became president and then chairman and chief executive officer of South Penn. After the merger of South Penn and Pennzoil in 1955, Hanks became president of the combined company. He retired from this post in 1957 but continued as a director and chairman of the executive committee. Loveland, chairman of Bradford National Bank, has been a director of South Penn since 1946. He was a director and treasurer of Pennzoil Co. before its merger with South Penn. He has been an active petroleum producer and has served as treasurer of Bradford Petroleum Co.

R. A. Wright, vice president of Sinclair Oil & Gas Co., and former manager of the New Orleans division, has been appointed Denver division manager. He succeeds **C. W. Horstmeier,** who will retire January 1 after 40 years with the Sinclair companies. Horstmeier, vice president and division manager since 1954, will be on special assignment until his retirement. Wright has been with Sinclair and its affiliates since 1926. He was assistant division manager in Denver before moving to New Orleans in 1957. The New Orleans division was recently merged into the Houston division and New Orleans offices were closed September 1.

WRIGHT

Six new appointments have been made in Humble's headquarters supply and transportation department, Houston. The men and their new assignments are: **J. E. Turton,** assistant head of schedules and forecasts; **Mead Ferguson,** adviser for projects in planning and economic analysis; **A. B. McDougall,** head of operations analysis in schedules and forecasts; **J. A. Dimock,** head of contracts and foreign crude; **Joe Miller,** head of gas-plant liquids; and **H. G. Eklof,** coordinator of foreign crude.

J. T. Roberts has been promoted to senior technologist in the crude and product-coordination department of Humble's Baton Rouge refinery. **A. E. Kunberger** has been named head of the lubricants and specialties-design group in the Baton Rouge process-engineering department. **L. H. Solomon,** engineer in process engineering, has succeeded Kunberger as head of the light-ends group, petroleum technical-service department. In the crude and product-coordination department, **J. F. Butterworth** has been named head of the chemical-products section. **W. L. Terrell,** division foreman in the oil-movement department, has been transferred to lubricants and wax in the same position.

▶▶▶ Personals

John H. Thacher, assistant to the chairman of Standard Oil Co. of California, has been appointed to a new executive assignment with responsibility for the company's interests in Huntington Beach Co. and Elk Hills Naval Petroleum Reserve. He will become executive vice president and a director of Huntington Beach Co., a California Standard affiliate. Thacher has been with California Standard since 1930.

THACHER

BOUCKE

FAY

He was at one time president of Iran California Oil Co., and vice president and director of California Research Corp. In the new post Thacher will be associated with **G. J. O'Brien,** vice president for governmental relations. **Fred C. Boucke** will succeed Thacher as assistant to the chairman of California Standard. Boucke has been president of Iran California Oil Co. in London. **E. Perrin Fay,** assistant manager of California Standard's Eastern Hemisphere operations staff, will succeed Boucke as president of Iran California, which manages California Standard's 7% interest in the Iranian consortium.

New research engineers at California Research Corp.'s Richmond, Calif., laboratory, include **Michael D. Rice, Paul L. Chapdelaine, Donald A. Bea, E. C. Lindner, Jr., Dr. David H. Chittenden, O. V. Larsen, Gerhard F. Knapp, Donald J. Orr,** and **Robert E. Olson.** Joining the Richmond lab as research chemists are **Dr. Robert G. Anderson, Dr. Merwyn L. Burrous, Luther H. Smithson, Jr., Dr. Joseph Lazar, David R. Rhodes, Kai Mow Wong,** and **George H. Kennedy. Mary L. Linnett** and **Shelby L. Brumelle** have joined the Richmond lab as research mathematicians. At the La Habra, Calif., laboratory, **Paul J. Durning** has joined the company as research engineer. **Thomas E. Ciotti** is new research engineer at the El Segundo, Calif., lab.

Richard D. Miller, assistant division land man in Phillips Petroleum Co.'s Shreveport, La., division, has been promoted to division land man. He succeeds **C. W. Stimson,** who has retired.

Dr. Richard A. Geyer will continue to head gravity operations of Geophysical Service, Inc., in the department's new Dallas headquarters. Gravity operations were formerly located in Houston.

Ron Worthington, British American Oil Co., has been elected president of Canadian Oil Scouts Association. He succeeds **Ray Huffman** of Canadian Fina Oil, Ltd. Others elected at the association's recent annual meeting in Banff were **Al Drummond,** Devon Palmer Oils, first vice president; **Con McGinnis,** Texaco Canada, second vice president; **Jim Thomson,** Union Oil Co. of Canada, third vice president; **Cliff Fiesel,** Canadian Devonian Petroleums, secretary; **Doug Manning,** California Standard Co., treasurer; and **Ivor Birchnall,** Imperial Oil, editor-in-chief.

C. O. Hopper, Canadian division drilling superintendent for Pan American Petroleum Corp., has been transferred to Pan American International Oil Co.'s New York offices. He had been with the Canadian division since 1952. **A. E. Piper,** Edmonton district engineer, will succeed Hopper. **J. K. Farries,** who has been on assignment at Pan Am's Tulsa general office, will succeed Piper as Edmonton district engineer. **J. L. Wilson,** petroleum engineer in Calgary, has been transferred to Tulsa. **J. S. Moore,** Edmonton, has been named Pembina area engineer. He succeeds **E. P. Shouldice,** who has been transferred to Calgary. **E. R. Wagner,** who has been in the Tulsa general office working with design and construction of the West Whitecourt gas plant, has been transferred to Whitecourt, Alta., as area superintendent.

Robert O. Goodykoontz, Tulsa, general manager of Humble's central region, has been named vice president in charge of the Esso

GOODYKOONTZ

BRYAN

Standard, eastern region of Humble. He will headquarter in New York. **William W. Bryan,** Humble's vice president for marketing, has headed the Esso Standard region for the past year. He will return to Houston to coordinate marketing expansion and nationwide activities. **Alex A. Diffey,** general manager of the Esso Standard region, will be responsible for regional operations until Goodykoontz' appointment becomes effective January 1. Goodykoontz was a vice president, director, and general manager of operations for Esso Standard Oil Co. before reorganization of the Jersey affiliates last year.

H. D. Horton, head of Gulf Oil Corp.'s land office in the Fort Smith, Ark., area, has been transferred to Corpus Christi, Tex., as area land man. He succeeds **E. P. Kennerly,** who has retired.

Jack H. Rebman, geologist with Sinclair Canada Oil Co. in Calgary, has been transferred to Casper, Wyo., where he will be geologist for Sinclair Oil & Gas Co.

W. V. Coffey, vice president, treasurer, and a director of Ambassador Oil Corp., Fort Worth, has been elected senior vice president and treasurer.

Charles J. Wiley has been named director of market research for Amoco Chemicals Corp. Wiley was with Callery Chemical Co. before joining Amoco.

John L. Ferguson has retired as vice president and director of exploration for Buffalo Petroleum Corp., Tulsa. Ferguson was with Amerada Petroleum Corp. and Deep Rock Oil Corp. before helping organize Buffalo's exploration department in 1954. He is a past president of Tulsa Geological Society.

Thomas L. Lang, geologist with Phillips Petroleum Co. in Evansville, Ind., has resigned to join **Richard W. Portis,** Evansville independent operator.

Howard Halff has been appointed assistant superintendent of gas and gasoline plants in Texaco's Houston division. Halff joined Texaco in 1948 in Tulsa. He has been in the Houston division gas and gasoline department since 1954. He is responsible for engineering, construction, and operating problems of the Houston division gas facilities and gasoline plants.

S. D. Whiteman, president of Kansas-Nebraska Natural Gas Co. since 1946, has been named chairman and chief executive officer. **Thomas Creigh, Jr.,** vice president in charge of production, transmission, and gas supply, has been elected president and principal operating officer. **Frank Flagg,** executive vice president, has been named financial vice president. The office of executive vice president has been discontinued. Three new vice presidents have also been named. **Frank Soldan,** general sales manager, has been named vice president, merchandising; **Stephen D. Ford, Jr.,** chief engineer, has been named vice president in charge of production and gas supply; and **Fred Steffens,** secretary and controller, also becomes a vice president. **James Asbury,** senior engineer, will succeed Ford as chief engineer. **John Ashburn,** engineer, has been named senior engineer. Executive committee members named by the board include Whiteman, Creigh, and Flagg.

John C. Flanagan, vice president and general manager of United Gas Corp.'s Texas division, has retired after 32 years with the United Gas companies.

D. W. Heeren has been named manager of pipeline and terminal operations in Tidewater Oil Co.'s western division transportation department. **A. L. Piper** has been named staff assistant to the transportation manager, with **F. G. Johnston** as chief engineer, pipeline department. New field position appointments include **E. A. Lyon, Jr.,** named San Joaquin Valley district pipeline superintendent in Coalinga, Calif., and **E. M. Greve,** named southern district pipeline superintendent in Wilmington, Calif.

Russell L. Van Gilder, senior engineer at Shell Oil Co.'s product pipelines field headquarters in Indianapolis, has retired after 33 years with the company.

▶▶▶ Personals

Fred H. Moore, executive vice president of Mobil Oil Co., has been elected a director of Magnolia Pipe Line Co.

Moore has been with the Socony Mobil companies since 1935. He had been executive vice president and general manager of Mobil Oil of Canada, production manager of Socony, executive vice president of the old Magnolia Petroleum Co., and exploration and producing vice president for Mobil Oil before becoming executive vice president of Mobil in March.

Recently granted the rank of fellow by American Institute of Electrical Engineers were **Joseph S. Quill,** of General Electric Co.'s electronics components division, and **Lloyd T. Williams** of Southwestern Electric Power Co. Quill was cited for his contributions to application of gas turbines and associated electrical equipment to gas pipeline pumping. Williams' citation mentioned his contributions to design and development of oil field electric supply systems.

▶▶▶ Deaths

M. E. (Eddie) Fannon, 75, Tulsa, retired vice president of Sinclair Refining Co., pipeline division, died September 4 in Denver after a heart attack. Fannon entered the oil business in 1917 with Prairie Pipe Line Co. When Sinclair took over Prairie he was named assistant to the president of Sinclair Prairie Pipe Line. He became a vice president of Sinclair Refining in 1943 and retired in 1947. Fannon had been associated with Rogers & Wright, Inc., Tulsa, in pipeline salvage work since his retirement.

Harold Sill Bell, 72, consulting petroleum engineer in Newark and Summit, N. J., died recently in a Summit hospital. Bell operated H. S. Bell, Inc., Petroleum Engineers, and an Italian subsidiary company in the 1930's. During World War II he became a petroleum consultant to the Board of Economic Warfare. He joined Frederick Snare Corp. of New York after the war and later resumed his consulting work.

Ira Tilden Milligan, 84, retired Tulsa drilling contractor, died September 4 in a Tulsa hospital. Milligan entered the drilling business in Ohio. He moved to Oklahoma before statehood and worked as a contractor in the Oilton, Drumright, Ochelata, and Bartlesville areas.

Herbert W. Durgy, 65, LPG sales manager for Cities Service Oil Co. in Toronto, died August 18 in a Toronto hospital. He had been with the Cities Service companies since 1922.

Frank C. Kerns, 76, retired general manager of Texaco's lubricating sales division, died recently in a Summit, N. J., hospital after several months' illness. Kerns was a past president of National Lubricating Grease Institute. He retired from Texaco in 1950.

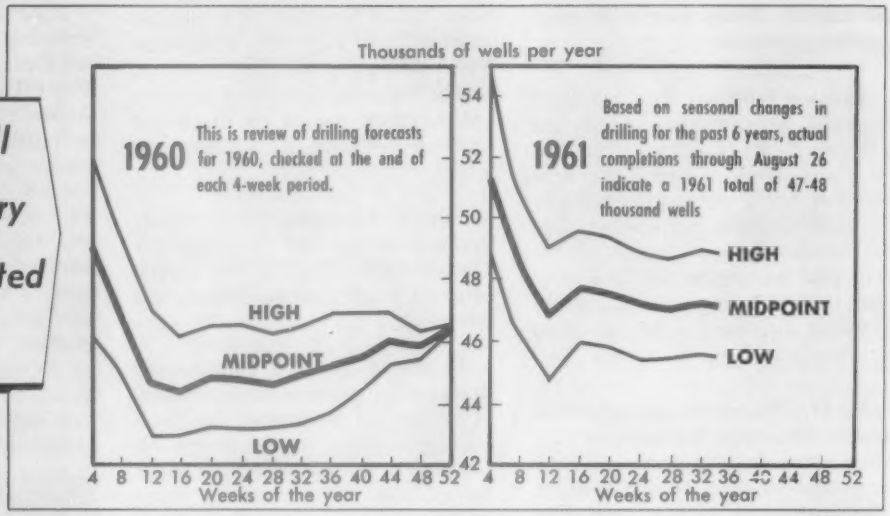
Ferdinand W. Dohring, 62, retired vice president and general sales manager of Elliott Co., Jeanette, Pa., died August 25. Dohring retired in July.

Clay Henry Daniels, 83, retired independent producer, died September 4 at his home in Tulsa. Daniels had been active in the oil industry since 1916.

N. Bass McDonough, 60, asphalt department area manager for American Oil Co., Atlanta, died August 22 in an Atlanta hospital.

Joseph B. Hamilton, 55, Denver division manager of Sun Oil Co., died September 1 in Denver. Hamilton had been with Sun 30 years.

Drilling is still lagging industry programs reported at midyear


Thousands of wells per year
1960
This is review of drilling forecasts for 1960, checked at the and of each 4-week period.
HIGH
MIDPOINT
LOW
54
52
50
48
46
44
42
4 8 12 16 20 24 28 32 36 40 44 48 52
Weeks of the year
1961
Based on seasonal changes in drilling for the past 6 years, actual completions through August 26 indicate a 1961 total of 47-48 thousand wells
HIGH
MIDPOINT
LOW
4 8 12 16 20 24 28 32 36 40 44 48 52
Weeks of the year

1961 drilling may still top 48,000 wells

BY JOHN C. CASPER

OPERATORS completed 30,105 wells in the first 34 weeks of this year. The period ended Saturday, August 26.

A comparison of total drilling so far this year with seasonal patterns in recent years will give an indication of probable total drilling for the year.

Over the past 6 years, completions for the first 34 weeks have ranged from 61.7% of the year's total in 1958 to 66.2% in 1956.

If the 30,105 wells reported on August 26 represented only 61.7% of total wells to be completed this year, then the expected total for the year is 30,105 divided by 0.617 or 48,790 wells.

On the other hand, if the 34-week total represented 66.2% of expected completions for the year, the indicated total would be 30,105 wells divided by 0.662 or 45,480 wells. Drilling for the year is almost certain to fall within these two extremes. If it happens to fall halfway between these limits, total completions for the year will be about 47,140 wells.

Charts on this page show seasonal changes in drilling during 1960 and also progressive projections of drilling for 1961, based on records for the past 6 years and reported completions at the end of each 4-week period.

The left chart shows that drilling was running well below normal in the early weeks of 1960. Most of the gains came in the last half. Actual completions for the first 32 weeks of 1960 indicated a total for the year of about 45,000 wells. Actual completions climbed to 46,751 wells by the end of the year.

Over the past 4 years, last-half completions have topped first-half totals by better than 11%. For the 4-year period ended 1956, the average last half exceeded first half by only 6.49%.

The middle line of the right chart indicates a drilling total of about 47,140 wells for this year. Projections based on operators' plans at midyear show 48,350 wells.

Since operators increased drilling programs sometime during the first half of the year, there is a good chance that completions for the last 4 months of 1961 will show a larger seasonal rise than the average in recent years.

Projection for 1961 at the end of 34 weeks is about 2,000 wells higher than the calculated forecast at the same time last year. If drilling in the last 4 months of this year follows the 1960 pattern, total completions will top 48,000 wells.

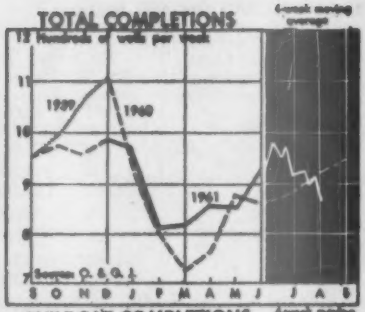
For a continuing check on the drilling outlook, divide total completions through October 7 by 0.7573. There is a good chance that the final total will top 48,000 wells.

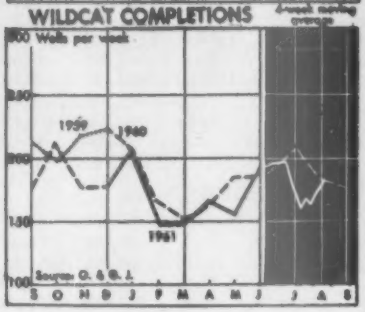
A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,049,925	DOWN	5,895	UP	112,865
Crude stocks	250,869,000	DOWN	2,796,000	UP	14,638,000
Completions	778	DOWN	155	DOWN	254
Refinery runs	8,564,000	UP	6,000	UP	270,000
Gasoline stocks	190,280,000	DOWN	976,000	UP	1,615,000
Kerosine stocks	34,061,000	UP	321,000	UP	177,000
Distillate stocks	152,269,000	UP	4,299,000	DOWN	754,000
Residual stocks	49,306,000	UP	1,745,000	UP	2,228,000
Four-product stocks	425,916,000	UP	5,389,000	UP	3,266,000
Total imports	1,362,100	DOWN	26,700	DOWN	41,200

Active Rotary Rigs

DRILLING





	9-4-61	8-28-61	9-5-60
Alabama	6	6	4
Alaska	12	11	7
Arkansas	10	11	11
California	78	76	76
Land	73	71	75
Offshore	5	5	1
Colorado	31	26	51
Florida	2	2	2
Land	0	0	2
Offshore	2	2	0
Georgia	1	1	0
Illinois	43	46	35
Indiana	11	9	11
Iowa	1	1	0
Kansas	89	91	105
Kentucky	8	15	2
Louisiana	293	279	271
North	48	46	28
S. Inland waters	101	101	93
S. Land	85	77	89
Offshore	59	55	61
Maryland	0	0	1
Michigan	22	19	38
Mississippi	71	68	50
Missouri	1	1	1
Montana	30	27	26
Nebraska	25	20	19
Nevada	0	0	1
New Mexico	108	121	108
New York	1	1	1
North Carolina	1	0	0
North Dakota	13	14	14
Ohio	9	7	5
Oklahoma	217	223	163
Oregon	0	0	1
Pennsylvania	10	9	12
South Dakota	0	0	3
Tennessee	0	1	2
Texas	676	637	583
S. Inland waters	7	7	3
S. Land	189	184	164
Offshore	2	1	1
North	60	55	51
Panhandle	63	62	48
East	70	67	50
West Central	163	147	154
West	122	114	112
Utah	39	38	31
Washington	1	1	1
West Virginia	11	11	5
Wyoming	62	66	58
Total U. S.	1,882	1,838	1,698
Cum. avg. to date	1,705	1,700	1,730
Western Canada	157	151	149
Eastern Canada	2	2	1
Grand total	2,041	1,991	1,848

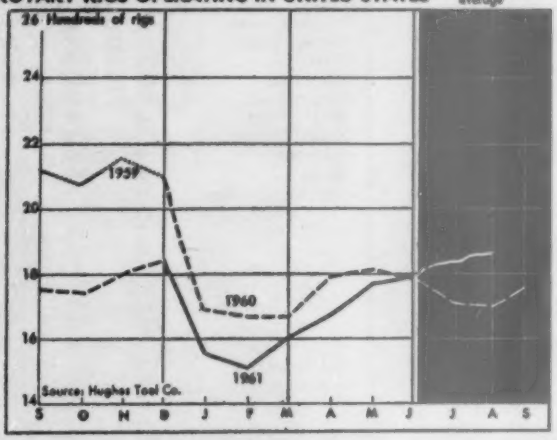
Hughes Tool Co. report.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 2, 1961

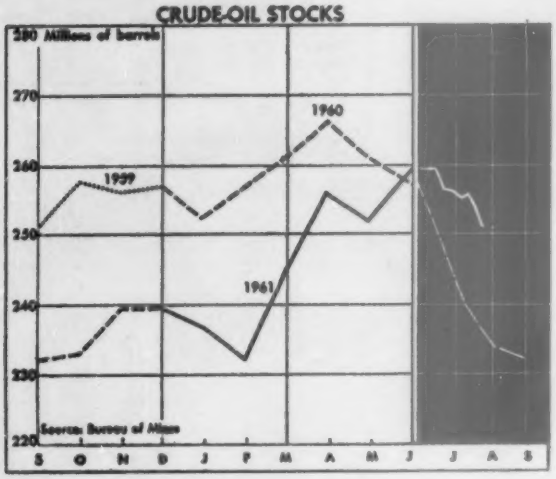
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1961	1960	Total	Crude	Cond.	Gas	Dry	1961	1960
Alabama	0	0	0	0	0	0	0	31	32	0	0	0	0	0	7	2
Alaska	0	0	0	0	0	0	0	30	.....	0	0	0	0	0	6	.....
Appalachian	18	2	0	12	2	2	46,842	1,401	1,212	0	0	0	0	0	52	40
Arizona	1	0	0	0	1	0	1,080	17	25	0	0	0	0	0	10	18
Arkansas	5	2	0	0	3	0	15,737	331	402	0	0	0	0	0	69	111
California	35	20	0	4	8	3	170,008	1,129	1,107	5	0	0	0	5	173	212
Colorado	18	3	0	2	13	0	76,231	408	423	8	0	0	1	7	192	215
Illinois	51	25	0	1	25	0	124,712	1,356	1,503	15	2	0	0	13	298	308
Indiana	30	9	0	1	20	0	41,559	492	680	7	0	0	1	6	129	253
Kansas	49	21	0	6	21	1	189,421	3,402	2,352	11	0	0	0	11	634	696
Kentucky	19	6	0	3	9	1	31,858	1,305	1,313	1	1	0	0	0	91	118
Louisiana	53	16	1	9	27	0	366,800	2,532	2,380	10	0	0	0	10	400	374
North	29	9	1	5	14	0	104,338	1,007	889	4	0	0	0	4	171	179
South	18	4	0	3	11	0	194,926	1,159	1,155	6	0	0	0	6	192	172
Offshore	6	3	0	1	2	0	67,536	366	336	0	0	0	0	0	37	23
Michigan	25	4	0	0	12	9	68,255	514	590	6	0	0	0	6	185	156
Mississippi	11	2	0	0	9	0	110,939	366	467	4	0	0	0	4	127	178
Montana	14	5	0	0	9	0	92,082	255	202	7	0	0	0	7	119	96
Nebraska	18	5	0	0	13	0	82,488	682	595	9	1	0	0	8	332	242
New Mexico	50	29	0	13	8	0	279,072	1,200	1,244	2	0	0	0	2	197	191
West	21	5	0	13	3	0	133,125	528	413	1	0	0	0	1	64	46
East	29	24	0	0	5	0	145,947	672	831	1	0	0	0	1	133	145
North Dakota	3	0	0	0	3	0	15,671	176	201	3	0	0	0	3	46	53
Ohio	27	10	0	6	8	3	70,705	699	684	1	0	0	0	1	33	35
Oklahoma	83	39	1	8	26	9	332,805	3,919	3,104	12	3	0	1	8	387	501
Texas	251	128	0	16	101	6	1,123,057	9,715	10,677	70	12	0	3	55	2,054	2,208
Dist. 1	17	12	0	0	5	0	37,268	599	737	8	3	0	0	5	243	277
Dist. 2	11	4	0	2	5	0	71,269	527	524	5	1	0	0	4	148	134
Dist. 3	24	14	0	2	8	0	170,881	778	823	3	0	0	0	3	150	152
Dist. 4	15	6	0	1	8	0	94,844	818	736	7	2	0	1	4	193	208
East	22	8	0	0	14	0	128,398	822	867	9	0	0	0	9	212	178
Dist. 7-B	32	11	0	3	18	0	89,122	1,222	1,551	12	1	0	0	11	341	449
West	67	41	0	2	23	1	317,165	2,414	2,795	17	5	0	0	12	516	435
Dist. 9	49	24	0	2	18	5	126,992	1,749	1,941	8	0	0	1	7	183	332
Dist. 10	14	8	0	4	2	0	87,118	786	703	1	0	0	1	0	68	43
Utah	4	0	0	0	4	0	25,411	163	168	3	0	0	0	3	74	57
Wyoming	13	4	0	1	8	0	63,858	621	705	5	0	0	0	5	233	286
Miscellaneous	0	0	0	0	0	0	0	139	122	0	0	0	0	0	126	101
Total U. S.	778	330	2	82	330	34	3,328,591	30,883	30,188	179	19	0	6	154	5,974	6,451
Prev. week	933	401	12	72	348	100	3,904,797	.....	.....	182	21	0	3	158	.....	.....
Cum. 1961	30,883	13,797	622	3,028	11,152	2,284	124,701,598	.....	.....	5,974	533	62	266	5,113	.....	.....
Cum. 1960	30,188	13,755	885	2,472	11,586	1,490	127,826,036	.....	.....	6,451	565	71	209	5,606	.....	.....
Western Canada	35	17	0	5	12	1	154,528	1,482	1,570	8	0	0	2	6	369	418

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	8-26-61	8-19-61	8-27-60
Pennsylvania	2,486	2,451	2,341
Other Appalachian	1,451	1,664	1,576
Illinois, Indiana, Michigan	10,815	10,508	9,053
Nebraska and North Dakota	3,750	3,663	2,824
Kansas	8,992	9,204	8,786
Oklahoma	17,132	16,874	15,793
Arkansas	1,785	1,755	1,800
Louisiana	19,542	19,749	18,027
North	3,274	3,495	3,151
South	16,268	16,254	14,876
Mississippi, Alabama, Florida	3,362	3,407	2,565
New Mexico	8,072	8,143	8,130
Texas	105,938	108,225	99,592
East Texas	8,031	8,544	7,571
West Texas	48,524	48,039	48,936
Texas Gulf	18,409	19,123	16,107
Other Texas	30,974	32,519	26,978
Wyoming	16,602	16,762	14,960
Other Rocky Mountain	9,619	9,843	9,450
California	24,144	24,153	26,863
Foreign	†17,179	17,264	14,471
Total	**250,869**	253,665	236,231

*Bureau of Mines. †Includes 4,776,000 bbl. in California.

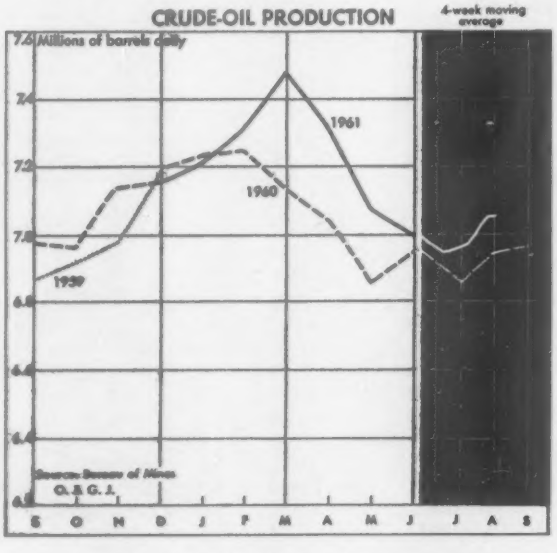
DAILY AVERAGE PRODUCTION FOR WEEK

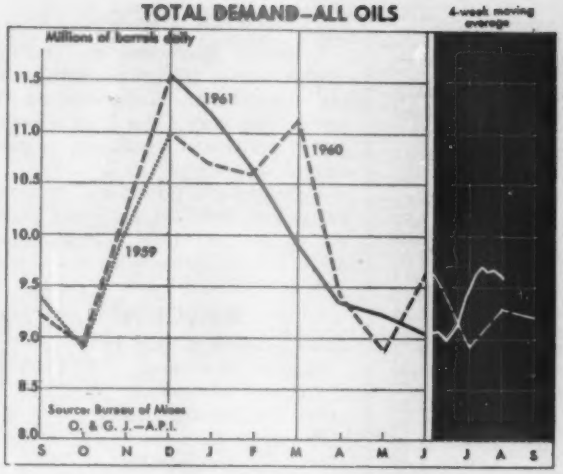
	September 2, 1961 Crude oil	Lease condensate	Total	Aug. 26 total
Alabama	17,025	.....	17,025	17,000
Alaska	21,300	.....	21,300	20,400
Arkansas	75,000	100	75,100	75,050
California	813,300	.....	813,300	813,700
Colorado	126,000	.....	126,000	126,500
Eastern	39,400	.....	39,400	39,600
Florida	1,000	.....	1,000	1,000
Illinois	214,000	.....	214,600	212,700
Indiana	30,400	.....	30,400	30,200
Kansas	†304,200	.....	†304,200	†303,020
Kentucky	51,400	.....	51,400	51,300
Louisiana	996,700	137,950	1,134,650	1,134,500
North	105,700	5,450	111,150	111,000
South	891,000	132,500	1,023,500	1,023,500
Michigan	53,300	.....	53,300	53,500
Mississippi	146,600	3,650	150,250	150,250
Montana	85,800	.....	85,800	86,400
Nebraska	63,700	.....	63,700	61,800
Nevada	400	.....	400	400
New Mexico	314,000	7,500	321,500	322,500
North Dakota	57,900	.....	57,900	56,800
Oklahoma	†495,600	.....	†495,600	†500,900
Texas	2,418,000	89,650	2,507,650	2,507,650
Dist. 1	42,000	2,600	44,600	44,600
Dist. 2	100,000	7,900	107,900	107,900
Dist. 3	312,000	38,000	350,000	350,000
Dist. 4	176,000	12,500	188,500	188,500
Dist. 5	27,000	600	27,600	27,600
Dist. 6	113,000	8,000	121,000	121,000
East Texas field	128,000	.....	128,000	128,000
Dist. 7-B	125,000	400	125,400	125,400
Dist. 7-C	103,000	3,450	106,450	106,450
Dist. 8	994,000	12,000	1,006,000	1,006,000
Dist. 9	193,000	2,500	195,500	195,500
Dist. 10	105,000	1,700	106,700	106,700
Utah	79,800	.....	79,800	87,300
Wyoming	405,000	.....	405,000	402,700
Others	‡650	.....	‡650	‡650
Total U. S.	6,811,075	238,850	**7,049,925**	7,055,820
Change from prev. week, down			**5,895**	
Canada	†644,000	.....	†644,000	†672,000

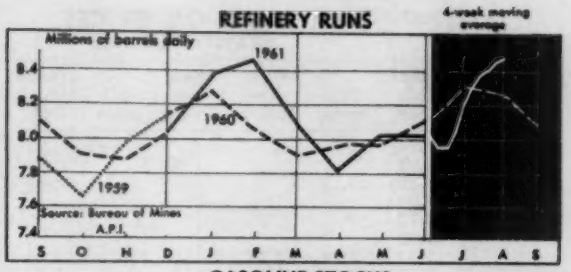
Total U. S. prod.—Jan. 1-Sept. 2 ..... 1,762,599,600 bbl.
Same period last year (crude plus cond.) ..... *1,728,356,100 bbl.

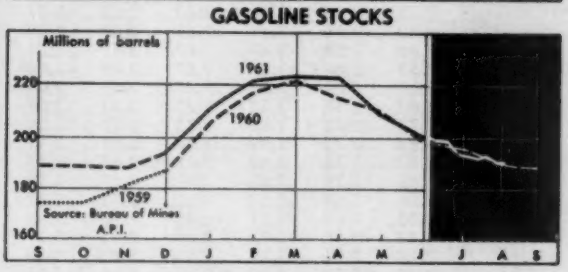
*Includes 55,782,600 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Arizona.

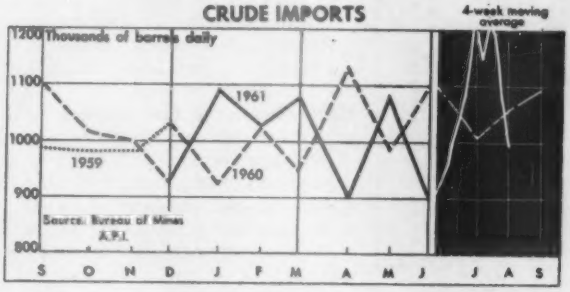
CRUDE-OIL PRODUCTION

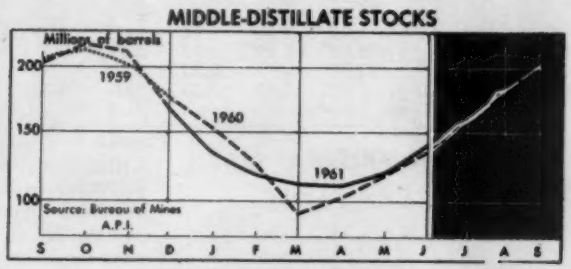


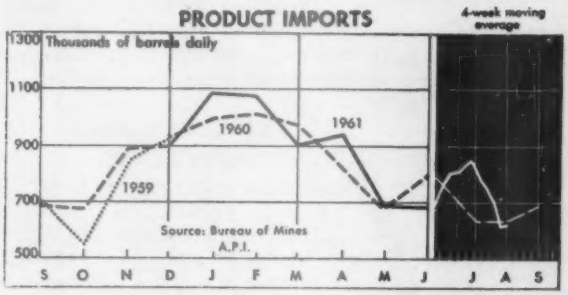


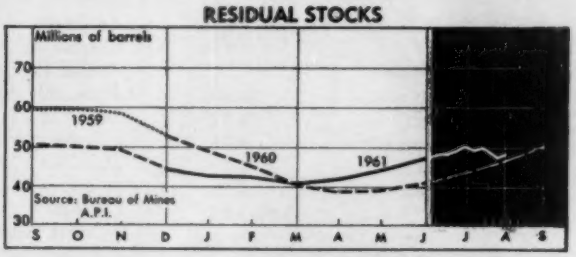












API REFINERY REPORT, SEPTEMBER 1, 1961

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, September 1960—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,187	535.0	42.3	316.1	155.8	46,773	13,180	53,676	12,980	1,165	510.5	30.7	337.7	131.6
Appalachian:														
District 1	106	47.0	4.7	25.3	6.7	5,128	604	3,404	390	94	41.6	3.3	22.9	6.6
District 2	107	57.0	1.3	24.4	7.1	2,612	467	1,559	285	107	55.3	5.2	20.3	10.3
Ind., Ill., Ky.	1,568	810.0	72.1	343.0	137.6	31,798	6,951	27,847	5,302	1,473	787.3	68.4	318.5	130.9
Minn., Wis., Dak.	130	62.3	5.0	31.6	18.7	6,648	1,644	7,731	651	117	54.3	3.9	28.5	15.6
Okla., Kans., Mo.	771	439.4	18.6	203.4	18.9	17,507	1,875	12,492	978	738	415.5	7.9	190.1	19.0
Inland Texas	312	204.4	13.0	42.9	21.3	7,256	617	1,650	2,729	296	231.0	9.6	47.7	21.3
Texas Gulf Coast	2,012	1,031.3	103.6	545.3	143.9	25,773	3,608	16,988	5,639	1,850	977.9	125.0	453.7	138.5
La. Gulf Coast	675	367.9	55.9	163.9	38.3	9,634	2,212	6,225	1,263	646	363.8	63.5	147.1	40.1
N. La. and Ark.	115	66.3	1.4	28.3	5.0	5,999	692	2,360	183	108	63.7	7.3	19.5	7.6
Rocky Mountain:														
New Mexico	25	13.9	0.4	4.4	2.6	600	60	225	63	22	11.9	0.3	4.2	2.1
Other	307	145.7	4.4	59.6	36.9	5,637	669	3,004	1,126	294	142.5	2.9	63.5	29.7
West Coast	1,249	598.1	43.9	178.7	215.8	24,915	1,482	15,108	17,717	1,190	544.1	31.2	177.2	306.0
Sept. 1, 1961	8,564	4,378.3	366.6	1,966.9	808.6	190,280	34,061	152,269	49,306	8,100	4,199.4	359.2	1,830.9	859.3
Aug. 25, 1961	8,558	4,398.7	385.7	1,998.9	782.7	191,256	33,740	147,970	47,561	.....	.....	.....	.....	.....
Sept. 2, 1960	8,294	4,171.4	385.9	1,824.9	861.0	188,665	33,884	153,023	47,078	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14.14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	....	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	.281	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	$4.80
Middle District	4.52
Southwest Pennsylvania	4.25
West Virginia	4.17
Buckeye Grade	4.08
Illinois Basin	**3.00-3.05**

FOREIGN

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)	
Arabian, 34.0°-34.9°, Ras Tanura	$1.80
Iranian, 34.0°-34.9°, Bandar Mashur	1.78
Iranian, 34.0°-34.9°, Abadan	1.73
Iraq, 35.0°-35.9°, Fao	
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.59
Qatar, 41.0°-41.9°, Umm said	1.95
Middle East, E. Mediterranean:	
Arabian, 34.0°-34.9°, Sidon	$2.17
Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli	2.19
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 36°	2.42
Canada:	
Leduc-Woodbend	$2.53
Redwater (Alta.)	2.42
Weyburn (light)	2.085
Midale C	1.71
Venezuela:	
Cumarebo, 47°-47.9°, Tucupido	3.34
San Joaquin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

TANKER RATES (Long ton)

(Latest reported spot fixtures)

★ Gulf-NY, clean (ATRS+10%)	$3.14
★ Gulf-NY, dirty (ATRS−5%)	2.71
★ Carib.-NY, dirty (ATRS+57.5%)	1.17
★ PG-UK, dirty (Scale−55%) (27s. 9d.)	3.89
PG-Japan, dirty (USMC−72.5%)	2.81

★ Denotes change from previous week.

REFINED PRODUCTS

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless other wise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (91 octane)	10.50-11.00
Premium (99 octane)	13.25-13.75
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.50-11.00
Regular (92 octane)	10.75-11.25
Premium (98 octane)	11.75-12.25
California (rack) Los Angeles:	
Regular (90 octane)	11.60
Premium (94 octane)	12.60
Premium (100 octane)	14.10
Caribbean area (cargoes):	
Regular (87 octane)	9.00
Premium (97 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.50-9.75
Diesel oil (58 d.i. and above)	9.00-9.25
Distillate No. 1	9.00-9.25
Distillate No. 2	8.25-8.50
Gulf Coast (cargoes):	
Kerosine 41-43	9.50
Distillate No. 2	8.50
New York Harbor (barges):	
Kerosine 42-43	11.20
Distillate No. 2	10.20
Diesel fuel, 48-52 d.i.	10.35
Caribbean area (cargoes):	
Distillate No. 2	8.10

RESIDUAL FUEL

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.65-1.75
Gulf Coast (cargoes):	
Bunker C fuel	2.20-2.30
New York Harbor (barges):	
Bunker C fuel	2.52
Caribbean (cargoes):	
Bunker C fuel	2.00
California (rack):	
Bunker C fuel, Los Angeles	2.25

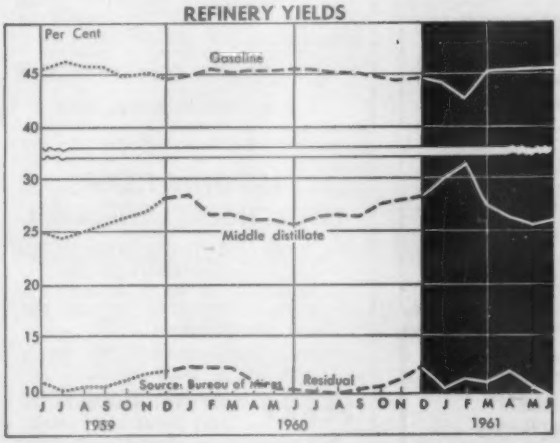
SUPPLY AND DEMAND—PRODUCTS

(Thousands of barrels daily)

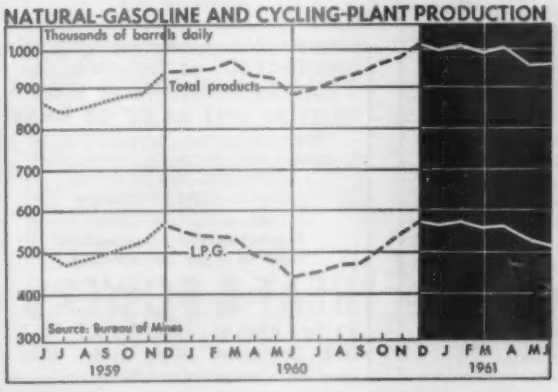
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
August 1961*	4,530	4,345	190,300
July 1961*	4,575	4,290	193,200
June 1961	4,651	4,039	197,640
September 1960	4,321	4,199	189,645
August 1960	4,501	4,230	190,322
KEROSINE			
August 1961*	317	375	34,100
July 1961*	285	355	32,000
June 1961	261	316	30,305
September 1960	296	359	35,408
August 1960	277	368	33,379
DISTILLATE			
August 1961*	1,355	1,990	152,300
July 1961*	1,350	1,880	131,000
June 1961	1,257	1,750	109,513
September 1960	1,339	1,831	168,235
August 1960	1,222	1,874	152,158
RESIDUAL			
August 1961*	1,350	805	49,300
July 1961*	1,375	815	49,800
June 1961	1,091	777	47,362
September 1960	1,290	859	37,343
August 1960	1,230	843	47,177

*Preliminary. †Thousands of barrels.

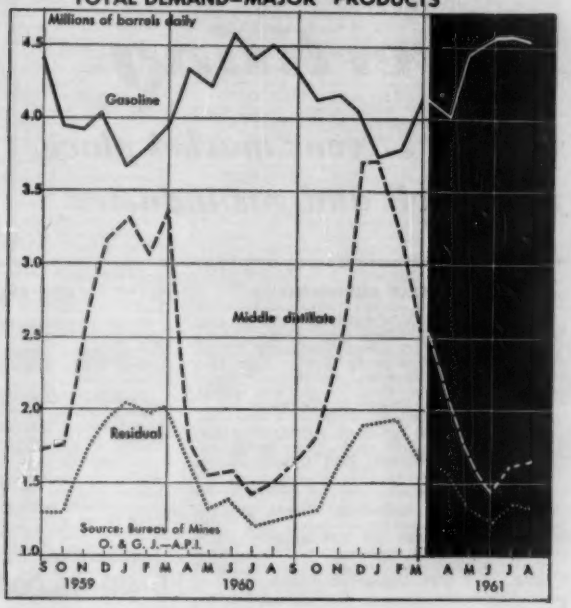
REFINERY YIELDS



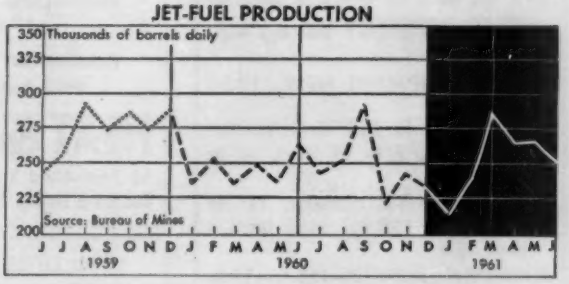
NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



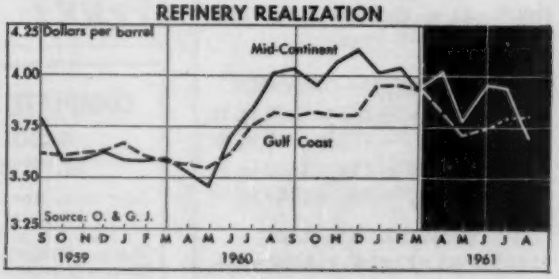
TOTAL DEMAND–MAJOR PRODUCTS



JET-FUEL PRODUCTION



REFINERY REALIZATION



REFINERY REALIZATION

	Aug.*	July*	June	May
Mid-Continent	$3.69	$3.89	$3.96	$3.80
Gulf Coast	3.81	3.78	3.75	3.75

*Preliminary. Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel and residual as published in The Oil and Gas Journal.

Classified Advertising

. . . your market place for the oil and gas industry

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- DISPLAYED CLASSIFIED $20 a column inch one issue. 10% discount three or more consecutive issues. Minimum size one inch Subject to agency commission.
- All classified payable in advance.
- DEADLINE: Copy to reach The Oil and Gas Journal not later than 9 a.m. on Wednesday preceding date of publication. Send advertisments to: Classified Advertising Manager, THE OIL AND GAS JOURNAL, P. O. Box 1260, Tulsa 1, Oklahoma.

EXCEPT . . .

WESTERN STATES: (California, Washington, Oregon, Idaho, Nevada, Utah, and Arizona). Write: Classified Departments, Inc., The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif. Phone AXminister 2-0287. Copy deadline Monday noon.

FOR SALE EQUIPMENT

USED GAS PROCESSING Equipment: Glycol and Dry Dessicant Dehydrators; Quick-cycle Hydrocarbon Recovery Units; Water Flood Filter-pump Units. Also new oil and gas production equipment. Engineered Specialties Co., P. O. Box 35683, Phone FL 1-5284, Dallas 35, Texas.

FOR SALE—100 miles of 6⅝" O.D. #18.97 T.&C. in the ground or to your Specification. Weiner Brothers, 1017 Empire Bldg., Pittsburgh 22, Pa.

TWO WATER Injection Triple Pumps, used, excellent condition: each 500 GPM at 1,200 PSIG, with 400 HP electric motor or 500 HP natural gas engine drive. Engineered Specialties Co., P. O. Box 35683, Phone FL 1-5284, Dallas 35, Texas.

LIQUIDATION

at ESSO REFINERY Balto., Md.

MOST EQUIPMENT NEW 1956

TOWERS—30" to 84" diameter, 20' to 97' high, 7 to 34 trays, up to 360 PSI

DRUMS—3' to 12' diameter, 12' to 45' long to 530 PSI, some lined—some NEW

PETRO-CHEM FURNACES—30.7; 19.3; 10.4; 9.7; 7.5 MM BTU/Hr.

NEW FURNACE TUBES—4000'—⅜" & ½" Wall Croloy 5—4" to 6"

PUMPS—88 to 400 GPM up to 2040' head—up to 8 Stage

HEAT EXCHANGERS—CONDENSERS

Stainless Tubes —235 to 2320 Sq. Ft.
Croloy 5 Tubes —573 to 1040 Sq. Ft.
Admiralty Tubes —216 to 1640 Sq. Ft.
Steel Tubes —238 to 2240 Sq. Ft.

COMPRESSORS & BLOWERS

7500CFM @ 42.5PSIG, 1250HP Synch.
129CFM @ 193PSIA Worth. HB 7½x9

LARGE QUANTITY TRANSFORMERS & MOTORS

WRITE FOR CATALOG

HEAT & POWER CO., INC.

60 East 42nd St., New York 17, N. Y.
310 Thompson Bldg., Tulsa, Okla.
Boston & Haven St., Baltimore 24, Md.

FOR SALE EQUIPMENT

FOR SALE—Reda Pump 76 Stage E59E; 100 HP; 3950' No. 1 cable, panel, reel, stands, tubing head. Jack Griffith, Box 289, Stillwater, Oklahoma.

FAILING 2500, 1500, Trucks, Floats, Drill Pipe, Collars, and related Equipment. Survey Drilling Company, 2032 Hawes Avenue, Dallas 35, Texas.

1—1952 MODEL 48-L Bucyrus-Erie Drill, trailer mounted, equipped with WAKU-D Diesel engine, 70' Tripped derrick, and tool crane. Machine has been used to drill only 9,000 ft. of hole. Cleaned and repainted. The Buckeye Supply Company, P. O. Box 1231, 18 Harrison Street, Zanesville, Ohio.

(8) 96,000 Bbl. 120'x48'

WELDED CONE ROOF OIL STORAGE TANKS INSTALLED NEW in 1952

Dismantled, Matchmarked For Reerection $75.00 N.T.

FOB Baltimore, Md.

HEAT & POWER CO., INC.

60 East 42nd St., New York 17, N.Y.
Boston & Haven Sts., Baltimore 24, Md.

AT N. LITTLE ROCK, ARKANSAS

3—Worthington #LTC-4 compressors, 3500 CFM @ 45 PSI, 24 x 15, 2-cyl., 500 HP, 4-cycle, gas-engine drive.

Phone POplar 3-3505

PERRY EQUIPMENT CORP.
1402 N. Sixth St.
Philadelphia 22, Pa.

COMPLETE LIQUIDATION

GASOLINE PLANT

ST. ELMO, ILLINOIS

Absorber, Reabsorber, Still, Stabilizers, Pressure Vessels, Butane, Propane and Gasoline Storage Tanks, Boilers, Heat Exchangers, Motor-Driven Pumps, Compressors, Two Electric Generating Plants, Truck Loading Rack, Rail-Car Loading Rack, Buildings.

This plant built to process 16 M.M. c.f./day with 60,000 gallons natural gasoline, 50,000 gallons butane, and 50,000 gallons propane.

Bids will be accepted on complete plant or on individual items.

HUMBLE OIL & REFINING COMPANY

To Inspect: Contact Mr. W. S. Stovall, Box 43, St. Elmo, Ill.
Information Only: Mr. J. F. Scott, Box 801, Tulsa, Okla.

FOR SALE EQUIPMENT

2500 FAILING, 58' mast, 5 x 8 pump, $25,000.00. Failing 1500 42' mast. Box 383, Chanute, Kansas.

50,000 FT.' 20 inch No. 1 grade used pipe. Lengths 20 ft. square cut ends. Weight 78# to the ft. High Tensile Pipe. Indiana-Ohio Pipe Co., P. O. Box 5462 Shep. Sta., Columbus 19, Ohio. Phone CL 3-5527—CL 3-5528.

GAS COMPRESSOR, "Oilwell," DGE125, two stage, gear driven, water cooled. Unit complete with clearance bottles, interstage scrubbers, "Happy" combination cooler, assembeld and skid mounted. Unit never used. Complete Spec's on request. Box 960, Lansing, Michigan.

28L PORTABLE. New Condition. Completely and fully equipped with all tools including Truck, Trailer, Doghouse, Forge and Power Plant. Call Bill Roberts, Glasglow, Ky. telephone OL 1-3850.

1—NATIONAL T-32 rig, complete, excellent condition. Located in Kansas. Inventory and price upon request. P. O. Box 287, Tulsa 1, Oklahoma.

One A. O. Smith Absorber 5'2" x 32'1" all welded SS 2-1 4" Shell 12 Trays with Mist Extractor Text Pressure 2260#—$15,000.00

American Petrofina Company of Texas

P. O. Box 1011, Mt. Pleasant, Texas

LIQUIDATION

Little Rock, Arkansas

11—28,000 gal. horiz. tanks, 11' x 38', dished, ASME 75 psi.

3—Worthington #LTC-4 air comp., 3,500 CFM, 24 x 15, 500 HP, nat. gas driven.

50—Heat exchangers, T316 Stainless, up to 2,000 sq. ft.

PERRY EQUIPMENT CORPORATION
1402 NORTH SIXTH STREET
Philadelphia 22, Pa., Phone POplar 3-3505

LIQUIDATING at Torrance, Cal.

CAT REFORMER NEW 1954

MUST BE OUT IN 90 60 DAYS

TOWERS—REACTORS—HEAT EXCHANGERS
DRUMS—PRESSURESPHERES—SEPARATORS
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HEAT & POWER CO., INC.

60 East 42nd St., New York 17, N. Y.
310 Thompson Bldg., Tulsa, Okla.

FOR SALE EQUIPMENT

AN INVESTMENT! Productive advertising is an investment rather than an expenditure. Experienced oil men have found that The Oil and Gas Journal is their best classified advertising medium.

USED NATIONAL T-12 Drawworks with Foster Automatic Makeup and Breakout Cathead, excellent condition. Also, 51 Double Shrunk National Tool Joints. Direct inquires to 1203 National Tower Building, Jackson, Michigan.

EQUIPMENT WANTED

WANT TO TRADE 36' Palmer Johnson Twin Screw Cabin Cruiser like new for equity in 4,000 foot trailer mounted drilling rig. Contact Ellison Miles, Trio Drilling Company, 2451 Stemmons, Dallas 7, Texas, Phone Riverside 8-0688.

WISH TO PURCHASE: Approximately 500 10-¾-inch linepipe collars. Contact Oiltex Supplies, Inc. for details, 1109 City National Building; 322-5288. Wichita Falls, Texas; 767-4308.

HELP WANTED

OIL FIELD EQUIPMENT Mechanics. Salary based on experience and ability. Box M-551, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL JOB DIRECTORY, foreign and domestic, showing where to apply for jobs. $5.00 cash OIML Co., Box 2665, Tulsa, Oklahoma.

INTERESTING position offered in France to engineer or retired executive with long thorough experience of condensate gas fields and broad knowledge of processing, petrochemical engineering, and economics for optimal utilization of gas products. Write Box M-560, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN—Reservoir Engineer, Mechanical Engineer—assist in design and installation of gathering stations and related. Electrical Engineer—Power generation and distribution. Operations Manager—experience, foreign. Mud Engineers. Mechanical Supervisors Petroleum Engineers. Gas Engineers. Instrument Mechanic Rotary Drillers. Cable Tool Drillers. Offshore Drillers and Toolpushers. Diesel Rig Mechanics. Production Foreman. Accountant Office Manager. Squeeze and Test Tool Operators. Workover Toolpushers. Jr. High Teacher—(science and math) to 35—must be single. Key Personnel, 405-711 Main, Houston, Texas.

DEPARTMENT HEAD
REFINERY EQUIPMENT INSPECTOR

Graduate engineer with minimum 5 years experience in inspection of all types of refinery equipment. Must have thorough understanding of applicable codes and pressure vessel design, API standards, etc. Modern midwest refinery. Furnish resume of education, experience, references and salary requirements to:

Box M-567, The Oil and Gas Journal, Tulsa, Oklahoma

PROCESS ENGINEER

Refinery Process Engineer with chemical engineering degree and minimum of 4 years experience for a modern refinery in Michigan. Furnish resume of education, experience, references and salary requirements to:

Box M-566, The Oil and Gas Journal Tulsa, Oklahoma

MOVING? SEND FOR BOOKLET

A free, 16-page booklet prepared by Burnham Van Service, Inc. can give you helpful, work-saving, cost-saving pointers on how to organize your move from city to city when you change jobs. How to prepare to move, tips on packing, a helpful inventory checklist of things to do are among the topics included. Write for your free copy. Chuck Swann,

BURNHAM VAN SERVICE
1634 Second Avenue, Columbus, Georgia
No obligation of course.

HELP WANTED

ASSISTANT MANAGER of Production Department wanted by Tulsa-based company. This is a responsible position requiring petroleum engineering degree, and minimum 10 years experience as petroleum engineer. Duties include supervision of field operations devoted almost entirely to waterflooding, plus substantial office petroleum engineering. Good starting salary with attractive future with aggressive and expanding company. Reply: Box M-550, The Oil and Gas Journal, Tulsa, Oklahoma.

STATISTICAL ENGINEER

Geoscientist with academic background in mathematical statistics for the position of statistical engineer with exploration company. Location: western United States. At least two years of mineral exploration experience and one additional year experience in the application of statistical analysis and/or operations research techniques to exploration problems preferred. Salary commensurate with experience and ability. Please send resumes of experience and training and salary requirements to: Box M-569, The Oil and Gas Journal Tulsa, Okla.

NATURAL GAS PERSONNEL

McGregor, North Dakota

On or about November 15, 1961, the following experienced natural gasoline plant personnel will be needed for employment:

Plant Operator—Stillman

Natural Gas Compresser Operators

General Gasoline Plant Mechanic

Assistant General Gasoline Plant Mechanic with some experience in working with pneumatic instruments.

Two Field Gathering System Operators experienced in the repair and operation of orifice meters.

The above openings are located at McGregor, North Dakota. Please send resume of experience to **Hunt Oil Company**, 700 Mercantile Bank Bldg., Dallas 1, Texas, Attn. Personnel Dept.

REFINERY MANAGER

A Refinery Manager is required for integrated independent oil company located in Alberta, Canada. Candidates for this position must have several years successful experience as Manager or Superintendent of moderately sized refinery, must be aggressive and sales minded and have experience in all phases of petroleum product manufacture from gasolines to asphalts, including industrial and specialty asphalts.

This is a unique opportunity for a man qualified in all aspects of refining to join a progressive organization presently embarking on an extensive programme.

Reply by letter, enclosing resume, detailing education background; work history, outlining your special achievements; recent photograph and references to . . .

Box M-561, The Oil and Gas Journal Tulsa, Oklahoma

SITUATIONS WANTED

GEOLOGIST—Eleven years with major, one with independent producer. Wide range of experience, everywhere except Gulf Coast. Will relocate. Box M-537, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST; 35, single. Presently employed Middle East, 6½ years foreign experience, eastern and western hemispheres in all phases of petroleum exploration. Desires interesting position, salary secondary. Excellent references available. Box M-552, The Oil and Gas Journal, Tulsa, Oklahoma.

PROJECT ENGINEER 36 years. Thirteen years diversified refinery, mine and chemical plant engineering, cost analysis, contracts, specification, design, drafting and supervision, will relocate. Box M-559, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PALEONTOLOGIST, 44 single, desires overseas position with oil company. 15 years experience with Tertiary and Cretaceous Foraminifera, and ammonites, in California, Colombia and Libya. Some field and wellsite work. Knows Spanish, learning Arabic. Box M-465, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, M.A., 45, family, 22 years experience major and independents, all phases exploration, management, entire U. S. and Canada. Relocate anywhere, prefer Calgary, Denver. Box 652, Midland, Texas.

PETROLEUM Engineer—31. Seven years diversified experience in drilling, completions, production, workovers, reservoir evaluation, and water flooding. Desires change to position with future. Box M-571, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—Wish to locate in foreign operation. 10 years all around engineering, supervisory and administrative experience with proven employment history of above average performance. References are of top management level. Resume on request. Box M-563, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION WANTED

WANTED: Leases or lease with production, locations to drill; or top acreage to drill outright. Prefer 2100 feet or above. Ind. Ky. Ill. Information confidential. Box M-553, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: marginal or isolated production. Fast quotes, good prices. Contact Joe A. Huitt, 1306 Philtower, LU 7-3080, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

SEVERAL LEASE BLOCKS, southeast Georgia, for sale, or drilling deals. Rotary drilling 4,000' slim hole, gas and oil seepages in area. T. R. Davis, P. O. Box 503, Phone 3639, Vidalia, Georgia.

DO YOU WANT production? Several leases Berea, 21' Sand, 19' Saturation, Core Analysis 6,800 barrels per acre. Offset to four million Big Injun well, rock pressure 600 pounds. Harry Wines, 703 Red Oak Street, Charleston, West Virginia, Phone night, DI 3-0348.

OIL AND GAS lease N½, SE¼ Section Nebraska. Detailed information write: Box M-568, The Oil and Gas Journal, Tulsa, Oklahoma.

CONCESSIONS ON untested sedimentary basin of Central America. Write, Don C. Sargent, 314 Paramount Bldg. Denver 2, Colorado.

OIL AND GAS lease N½, SE½ Section 340, Block 1-A, H & TC RY Co. survey cert. No. 38/4340 containing 480 acres Coke County, Texas. Bonus $1.00 per acre, rental $1.00 per acre. Mrs. Louis Seidl, Otis, Kansas.

DRILLING 155 ACRE lease proven oil producing area Bartlesville Sand production three sides and offsetting production two sides. A proven waterflood sand with large reserves, Contract proposition, MURCO, Box 59, Cherryvale, Kansas.

GOOD PROSPECT. 6,500 acres within mile of good very shallow oil production. Reasonable. Box M-533, The Oil and Gas Journal, Tulsa, Oklahoma.

DO YOU HAVE A LEASE TO SELL? For as little as $5 per week you can tell your proposition to over 45,000 oil men through the Journal's classified advertising pages. You'll be surprised how many are interested.

1,500 ACRES, more available, 1½ miles from 7 million gasser, 2,500' pay. Three miles to pipeline Northern Montana. Box M-532, The Oil and Gas Journal, Tulsa, Oklahoma.

READ THIS

I have 5,300 acres of recorded oil and gas leases in Southern W. Va. on well known structures, and more territory available. Low rental and 10 yr. term. Want someone to take over and operate and carry me on overriding royalty interest. Full information on request.

Box M-565, The Oil and Gas Journal Tulsa, Oklahoma

BUSINESS OPPORTUNITIES

WILL DRILL TEST well in southeastern Ohio with bottom hole money. Let me prove your acreage. I have thousands of acres in this vicinity. David Law, 716 Union Trust Building, Parkersburg, W. Va.

PRODUCER NEEDS associates to develop proven 160 acres. Bartlesville sand 750' deep, one well already drilled ready for completion Labette County, Kansas. For particulars write: Box M-547, The Oil and Gas Journal, Tulsa, Okla.

ONE THIRTY-SECOND (1/32) override for sale under one hundred thousand acres in Ohio and West Virginia. David Law, 716 Union Trust Building, Parkersburg, W. Va.

OIL AND GAS LEASES

Exploration company will sell full interest leases on acreage in drilling blocks scheduled for prompt exploration, in near vicinity of proposed test wells. These blocks cover favorable geophysical and/or geological features in various oil plays in several states. Why not have your own lease near a test well? No partners or further cost to you for the test well drilled.

Write our staff at P. O. Box 6072, Station B, Evansville, Indiana, or call HA 3-1618 for details and information.

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These securities are not registered for offering or sale in the state of Illinois.

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FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential. You can send the details of your proposition direct or thru your attorney to Consultant 617—51st Street, Brooklyn, N. Y.

WILL SELL OR TRADE for producing properties in Kansas or Oklahoma, a 1955 Bethlehem S-45 Rotary with GM power, completely equipped to drill easily 5,000'. Operator has drilled only 46 wells with this excellent rig. Twin Drilling, Inc., 1005 Central Building, Wichita, Kansas.

BUSINESS FOR SALE—Timber business located in Missouri and Illinois having an average net profit before taxes of $250,000.00 for last two years. Price of $1,250,000.00 includes cash, all assets in two corporations. Excellent financial condition, no indebtedness. Will take royalty interst in producing oil or gas wells, or other suitable business as part payment. Box M-570, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Must retire, will sacrifice supply business, house, etc., near new field. Box 299, Blanding, Utah.

DO HIGH rentals keep you from buying? I can get you oil and gas leases reasonable, with cheap rentals, in active areas. Contact Box M-572, The Oil and Gas Journal, Tulsa, Oklahoma.

We, TOO, believe that oil is only where you find it but we also believe that the most overlooked shallow play in Illinois is in the western part of the State. New shallow fields produce from 650 feet and above. For information concerning leases and drilling blocks write Petrolini Corporation, P. O. Box 89, Mt. Sterling, Illinois.

FOUR WELLS in Bartlesville Sand on 80 acre lease in Glennpool area of Creek County, Oklahoma, now under pilot waterflood. Interested in expanding operations. Will associate with experienced operator with drilling tools, equipment and capital. In vicinity of several successful floods. Additional acreage available. Box M-557, The Oil and Gas Journal, Tulsa, Oklahoma.

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I NEED reliable brokers, who can supply my clients with choice producing royalties and over-rides at reasonable prices with fair commission on sales. Box M-562, The Oil and Gas Journal, Tulsa, Oklahoma.

NEED PARTNER with tax dollars to drill wells in West Virginia and Ohio at actual cost. Wildcat and semi-proven acreage. David Law, 716 Union Trust Building, Parkersburg, W. Va.

MONEY RAISING

INVEST IN PROVEN fields Ritchie and Calhoun Counties, W. Va. Drilling to Big Injun and Berea. Paid $4.17 bbl. and 25 cents M. P. O. Box 215, Wheeling, W. Va.

BUSINESS SERVICE

DELAWARE CORPORATION formed and serviced American Guaranty & Trust Company. P. O. Box 487, Wilmington, Delaware.

REAL ESTATE

FOR RENT—Large office room, warehouse and parking lot. 853 W. Foster St., Pampa, Texas. Glen Ragsdale.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Indian Affairs, Crow Indian Agency, Crow Agency, Montana. Sealed bids will be received until September 28, 1961, 2:00 o'clock, P.M., Mountain Standard Time, and opened at that time in the office of the Crow Indian Agency, Crow Agency, Montana, for the leasing of 19,031.79 acres of tribal lands and 40 acres of allotted lands all located in Twp. 6 S., Rge. 32 East and Twps. 9 and 10 South, Rges. 37 and 38 East, Big Horn County, Montana, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of Crow Indian Agency, at Crow Agency, Montana.

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API Says Longer Oil Change Interval Will Cause Engine Damage

AUTO manufacturers are inviting engine trouble by going to longer crankcase - drain recommendations, according to additional technical data released by the American Petroleum Institute.

But API does not refer directly to the controversial Detroit recommendations — particularly that of Ford Motor Co. for a 6,000-mile drain interval. And the oil industry isn't inclined to join battle with Ford, at least in public, over what API terms an honest difference of opinion.

General Motors and Chrysler Corp. recommend draining of the crank case at the 4,000-mile mark for all their models.

The API says findings from the latest laboratory and road tests conducted by oil-company members affirm the value of the present API oil-change policy—every 30 days in winter, every 60 days in summer, but never exceeding 2,000 miles.

When intervals are extended, recent tests indicate, piston-ring wear more than doubles, engine deposits increase, more varnish and sludge are formed, and the crankcase oil becomes increasingly contaminated.

In passenger-car road tests, ring clogging when oil was changed at 2,500 miles was more than three times the level at 1,000 miles. "This adversely affects oil consumption," the API report said, "and therefore car-operating economy."

Piston-ring wear more than doubles when the drain interval is extended from 1,000 to 2,500 miles, according to laboratory radioactive-tracer wear test.

Tests on passenger cars and taxicabs showed that more than twice as much varnish forms at 2,500 miles than at 1,000 miles. After 1,000 miles, only moderate piston deposits were observed. After 2,500 miles, piston walls were covered with contaminants.

With oil-drain intervals extended to 4,300 miles by the average motorist before Ford's 6,000-mile recommendation, the service - station dealer will have to sell harder to avoid further loss of lube business.

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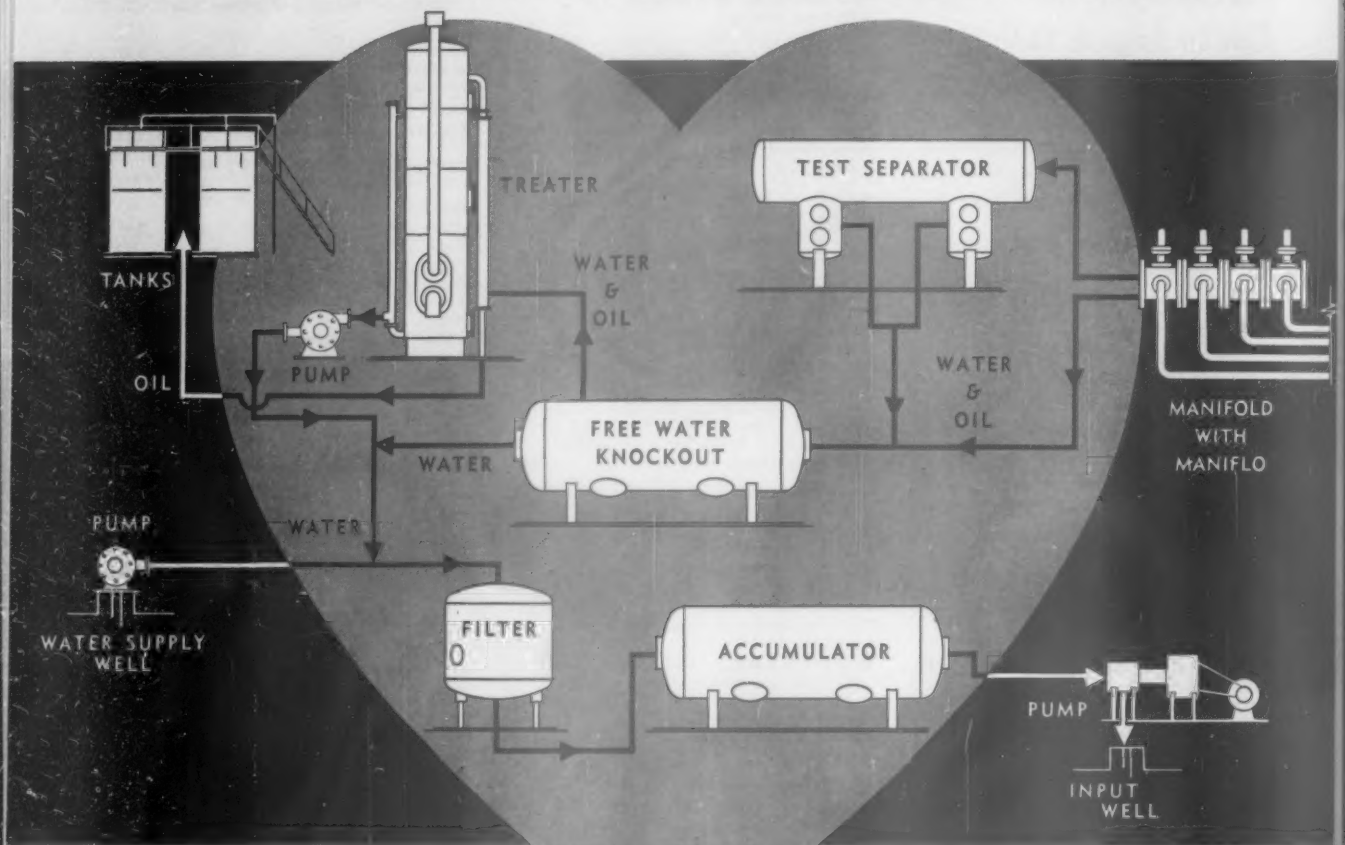

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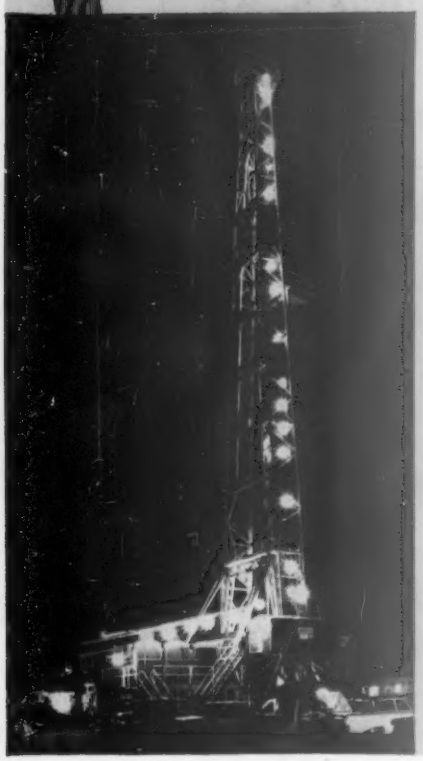

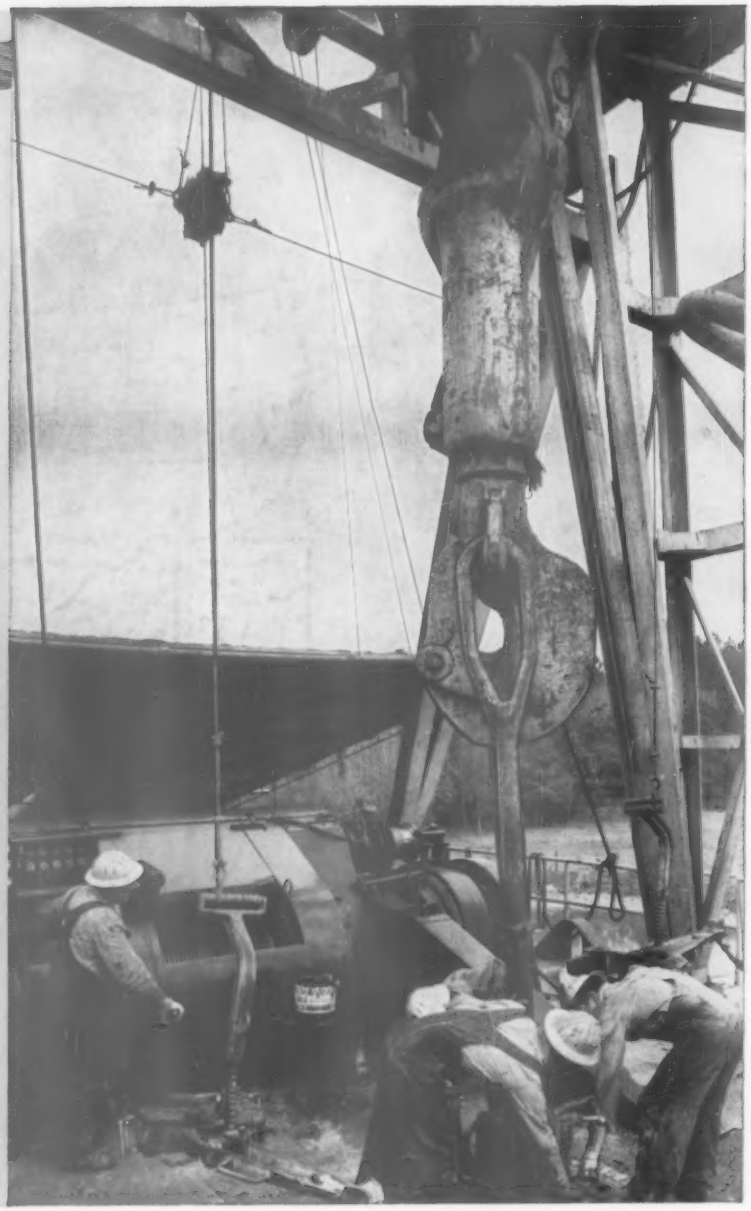

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